

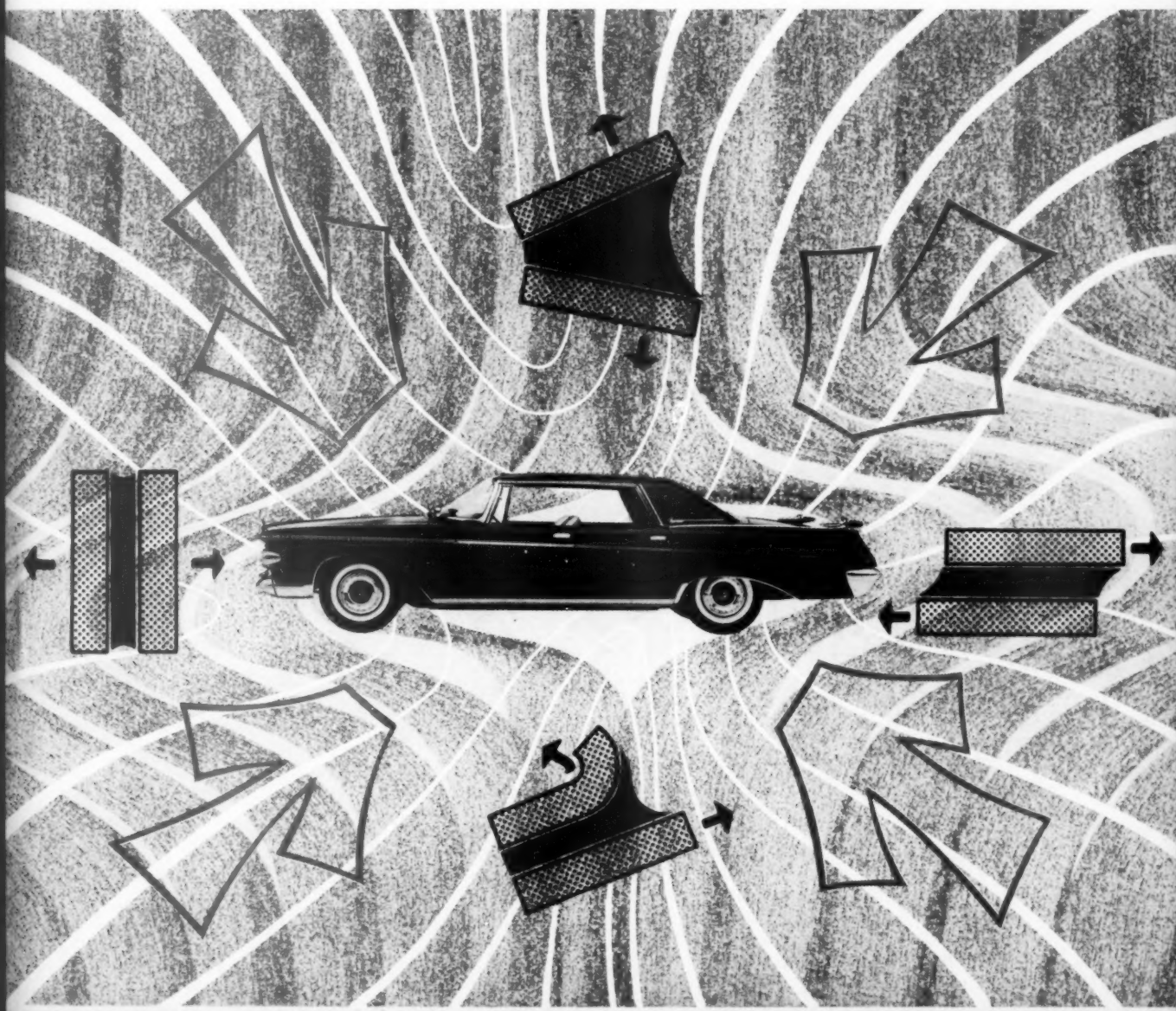
A HITCHCOCK PUBLICATION

assembly & fastener

ENGINEERING

DECEMBER • 1961

50 CENTS



An Automotive Look at Structural Adhesives

**this man
had a
fastener
problem...**



and here's how Pheoll solved it

He's skimming the surface now—yet a short time ago this design engineer was “knee-deep” in a 2-way fastener problem: First, how to hold a board absolutely rigid against the flange guide of a table saw; and second, how to produce the fastener on a simplified and economical basis. Originally, his company tried using an ordinary “C” clamp, but later switched to a hand-assembled 3-piece post clamp. This too proved costly and inadequate.

Pheoll came into the picture and immediately reduced material costs and eliminated a bending operation; replacing a four slide part with a cold headed thumb screw. Then Pheoll dog-pointed and end-drilled the bottom of the thumb screw which allowed the attachment of a permanent spinning grip washer. Previously, this piece consisted of three parts manufactured by three separate industries.

Pheoll automatically produced and assembled the one-piece unit, shipping it to the table saw manufacturer at lower costs—with none of the previous manufacturing, assembly or inventory problems. *This is Pheoll in action*—a versatile, cost-conscious, quality-minded team ready to serve you...the next time you have a fastener problem.

Pheoll Manufacturing Company, Inc.
5700 WEST ROOSEVELT ROAD CHICAGO 50, ILLINOIS

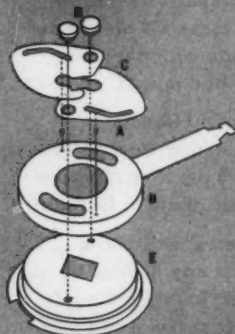


**HEADING THE
FASTENER
INDUSTRY
FOR OVER
50 YEARS**

Use postpaid card. Circle No. 201

PRESSTAKER

The ONE Machine That Presses AND Stakes
Cuts Assembly Costs For POLAROID



Shutter Assembly

Guide pins (A) are staked into diaphragm mounting cup (B), then .0005 blades (C) are staked to mounting (E) with studs (D).

"Presstaker is as versatile, simple and easy to operate as our cameras," says Polaroid Corporation. "To help us match production to market demand at the lowest possible cost, we put in 18 Presstakers.

"Our cameras require many different assemblies, so we must have production equipment we can change over from one job to another — fast.

"With Presstaker, our operators change tooling right at the bench. What's more, the wide range of pressing and staking forces lets us assemble parts made of plastic as well as stainless steel.

"We're constantly improving the Polaroid camera, but we can continue to use our Presstakers even on re-designed assemblies."

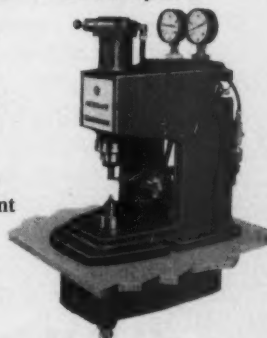
What can PRESSTAKER do for you?

- Cut labor costs • Eliminate subassembly inventories
- Reduce capital equipment costs • Save space
- Reduce design limitations
- Overcome human error

Presstaker combines staking *and* pressing operations in one automatic assembly tool; it does a better job of pressing *or* staking independently.

Assembles up to 1,400 parts per hour, with uniform stake penetration and a staking point shift of under .001 inch, with forces as high as 1-ton.

Send for Presstaker bulletin. All models, production rates, work space dimensions and tooling illustrated.



Model 010B-CA

Cramer

Division • Centerbrook, Connecticut

GIANNINI CONTROLS CORPORATION

Use postpaid card. Circle No. 204

BEHR Announces the NEW "HI-SPEED 400" PINCH POINTER

- High-speed operation . . . processes 400 pieces per minute with needle or diamond points.
- Dies and transfer mechanism cost as little as \$35 per item. Set-ups can be made in 15 minutes.
- Wide capacity range . . . points any headed screw blank, in any material, between No. 2 and .281" in diameter, $9/32$ " to 2-1/2" in length.
- All-welded unitized construction guarantees easy maintenance. Easily adjustable feed rails. Helical gears run in oil bath. Practically maintenance-free in design.
- Rotary-type 4-speed hopper, V-belt drive, powered with 3/4 HP motor for heavy loads. Feed rails equipped with Syntron vibrator. Pinch mechanism uses 5 HP motor.
- Compact design requires minimum floor space. Unit measures 30" x 66", is 66" high.

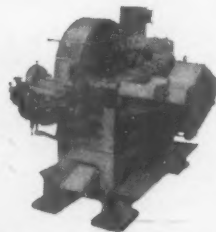
MODEL B.400
Patented



Points any screw blank from No. 2
to 5/16" diameter at 400 pieces
per minute.

This new concept in Pinch Pointers lets you set up any job in 15 minutes, with tooling that eliminates dials . . . costs as little as \$35 per item . . . and processes at a speed of 400 pieces per minute. Advanced design enables this one machine to point screw blanks or any other product requiring needle or diamond type points, of any material, from a No. 2 up to a $5/16$ " (.281") diameter screw, in lengths from $9/32$ " to 2-1/2". For complete details on the many other outstanding features of this new Behr No. B-400 Pinch Pointer, write for catalog No. PP661.

We also manufacture the
BEHR COLD HEADER and
are equipped to set up complete fastener
plants or departments. For further
information contact . . .



BEHR

MACHINERY & EQUIPMENT CORP.

1172 Seminary St., Rockford, Illinois
Phone WOODLAND 2-7721 Cable BEHRMEQ

Since 1942

ROSÁN

has set the pace ...

To Our Many Friends
Warmest Holiday Wishes



In the fastener industry today,
as in the past, the trend is to
follow the design and
engineering principles
originated by Rosán...

Thousands of fasteners, embodying
unique ROSÁN engineering principles,
are now in world-wide use.

For imaginative solutions to fastening
problems get in touch with the company
that consistently sets the pace...



ROSÁN, INC.

2901 West Coast Highway
Newport Beach, California

Use postpaid card. Circle No. 206

ROSAN
RING LOCKED
STUD

ROSAN
RING LOCKED
HYDRAULIC
FASTENER

ROSAN
PRESS-NUT

ROSAN
KNIFE THREAD
INSERT

ROSAN
LIMBERT
INSERT

Designers and Manufacturers of the World's Finest Precision Fasteners

U.S. AND FOREIGN PATENTS PENDING

COPYRIGHT 1961 ROSÁN ENGINEERING CORP.



for nut setting . . .

Add skill to these hands with the right air tools

Nut setting—or any production fastening job—Gardner-Denver can provide exactly the right air tool to keep expensive hands working at top efficiency. Each air motor size provides the basic “building block” for hundreds of different tools. Thus, you’re assured of complete versatility and interchangeability so vital to ever-changing production methods. For details, see your Gardner-Denver air tool specialist or write for Section 16 bulletins.



EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Ill.—Offices in principal U.S., Canadian and Mexican cities.
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario.

International: Gardner-Denver International Division, 233 Broadway, New York 7, N. Y.
Offices: Buenos Aires, Argentina; Artarmon, N.S.W. Australia; Brussels, Belgium; Rio de Janeiro, Brazil; Santiago, Chile; Barranquilla, Colombia; Lima, Peru; Ndola, N. Rhodesia; Salisbury, S. Rhodesia; Johannesburg, Transvaal.

Use postpaid card. Circle No. 207

Assembly & Fastener Engineering

assembly & fastener

ENGINEERING

BETTER DESIGN AND ENGINEERING FOR ASSEMBLY

Volume 4, Number 12

December, 1961

PUBLISHER

WILLIAM E. JACOBS

EDITORIAL STAFF

MATT E. HEURITZ, *Editor*
RUDOLPH A. MATR, *Associate Editor*
WILLIAM D. ENGSTRAND, *West Coast Editor*
SHIRLEE R. EUL, *Editorial Assistant*
A. S. JENNINGS, *Editorial Assistant*

EDITORIAL ART DEPARTMENT

ROBERT R. HADLEY, *Art Director*
Associate Art Directors
HAROLD GREAVES
RALPH M. ERICSON
L. M. SCHROEDER

HITCHCOCK PUBLISHING BOARD

EDGAR ALTHOLZ
MATT E. HEURITZ
VINCENT C. HOGREN
BRUCE B. HOWAT
WILLIAM E. JACOBS
DAVID H. JOYCE
MAURICE M. PATTERSON
CLARENCE A. PEARSON
W. EDWARD POOLE
WILLIAM F. SCHLEICHER
DARRELL WARD

BUSINESS STAFF

HENRY J. SMITH, V.P., *Western Manager*
DAN E. REARDON, V.P., *Eastern Manager*
RAYMOND J. SIETSEMA, *Director of Marketing*
RICHARD A. ELLIOTT, *Promotion Manager*
EUGENE W. WEST, *Director of Reader Services*
ROBERT L. SPRECKELS, *Director of Circulation*
D. B. REED, *Circulation Supervisor*
JOHN S. TODD, *Production Manager*
D. L. CAMPBELL, *Advertising Production Manager*

HITCHCOCK DIRECTORY DEPARTMENT

RAYMOND H. SMITH, *Manager*
M. C. ROUTA, *Editor*
M. E. MOFFETT, *Editor*

EXECUTIVE OFFICERS

ROBERT C. VAN KAMPEN, *Board Chairman*
O. A. FELDON, *President*
VINCENT C. HOGREN, *Executive Vice President*
J. MORRIS GUSTAFSON, V.P. and *Treasurer*
EDWARD P. MADIGAN, *Secretary*



LOOKING AHEAD

Among the articles coming up in the next few months are the following:

- Evaluating Fastener and Joint Performance with a Load Analyzer
- Soldering the New Exotic Alloys
- Arc Spot Welding of Thin Gauge Stainless Steel

DEPARTMENTS

Book Review—Production Control	6
Publisher's Page—Not Later, Now	9
Business Column—The Outlook for 1962	11
Assembly Ideas and Field Reports	15

FEATURES

An Automotive Look at Structural Adhesives—Part 1	30
Yankee Ingenuity vs. Imports	34
Expansion-Fit Technique for Bearing Raceways	36
Assembly Control Via Automatic Data Processing—Part 2	37
Aerospace Industry Sparks Revolution in Fasteners	41
In-Plant Wire Drawing Ups Quality of Roller Chain Pins	45

DEPARTMENTS

As Rudy Sees It	48
What's New in Assembly Equipment	51
What's New in Fastening and Joining Materials	63
Useful Literature	71
Industry Makes News	77
One Last Word—Make the Reward Equal to the Risk	86

HITCHCOCK DISTRICT OFFICES

New York: 551 Fifth Ave., Murray Hill 7-6310; Connecticut: S. Glastonbury, MEEdford 3-7083; Willimantic, 300 Mansfield Ave., HArrison 3-0911; Boston: Hingham, Mass., Box 185, RIverview 9-1960; Cleveland: Union Bldg., 1836 Euclid Ave., 621-3731; Cincinnati: 1410 Wynnburn Park Dr., BLackburn 1-2987; Detroit: 10432 W. McNichols, DIamond 1-9525; Los Angeles: 133 S. Alvarado St., DÜnkirk 9-2981; San Francisco: 681 Market St., YUkon 2-4280; Seattle: 786 Dexter Horton Bldg., MAIn 2-4363.

HITCHCOCK MAGAZINES AND DIRECTORIES

Assembly & Fastener Engineering	Hitchcock's Assembly & Fastener Directory
Machine and Tool Blue Book	Hitchcock's Machine and Tool Directory
Hitchcock's Wood Working Digest	Hitchcock's Wood Working Directory
Metropolitan Transportation	Cutting Tool Engineering
School Bus Transportation	Grinding and Finishing
	Plant Management & Engineering

Publishers of Business Magazines and Directories Since 1898.

Member, Business Publications Audit of Circulation, Inc.

Assembly & Fastener Engineering is published monthly, Copyright, ©, 1961 by

Hitchcock Publishing Company, Hitchcock Building, Wheaton, Illinois, Printed in the U.S.A.

Subscription rate is \$6.00 per year in U.S.A., \$7.50 per year elsewhere.

Editorial and Executive offices: Hitchcock Building, Wheaton, Illinois

All phones: MONTrose 5-1000. Cable HITCHPUB.

New all-wrench tool set cuts maintenance time

Snap-on

181-piece nut-turning set



SNAP-ON 5181-GS-B Set
181 tools in metal box

This SNAP-ON set is the timesaving answer for a maintenance man with a wide range of nut-turning jobs. The selection of 181 tools contains every standard wrench size from 3/16 to 1-7/8 in. Included are open-end wrenches, box wrenches, combination wrenches, flexible head wrenches, ratcheting box wrenches and socket wrenches.

Socket wrenches include handles and sockets in 1/4-in., 3/8-in., 1/2-in. and 3/4-in. square drive sizes. You get a full range of socket handles — ratchets, speeders, slide bars, spinners, extension bars.

Tool chest embodies all the best SNAP-ON construction features — full-length, piano-type hinges; reinforced channel top; easy-sliding, no-sag drawers; close spot welding for added strength; double-rolled edges for rigidity; and strong trunk handles for lifting the chest.

Got a tool problem — ask your SNAP-ON sales engineer

The SNAP-ON sales engineer is a specialist who devotes *all of his time* to the industrial application of wrenches and mechanics' hand tools. He welcomes the opportunity to help you solve your assembly and maintenance tool problems. Write us for his name or call your nearest branch. Free catalog of industrial wrenches is yours for the asking.

FOR ALL INDUSTRY
SNAP-ON TOOLS
8033-L 28th AVENUE • KENOSHA, WISCONSIN

Use postpaid card. Circle No. 208

Book Review

PRODUCTION CONTROL

by William Voris Ph. D.
Dept. of Management,
Los Angeles State College

Probably the four most important problems facing manufacturing companies are: (1) Satisfying customers concerning delivery dates and quality. (2) Producing at the lowest possible cost. (3) Maintaining the lowest possible capital investment. (4) Reducing the peaks and valleys in production cycles.

The objective of production control is to synchronize the work of all those concerned to satisfy these four demands.

In this revised edition, the basic principles of production control and their application to industrial production are presented in text book form.

It combines the thinking and research of people in the field of industrial management and control. It shows the practical day-to-day application of fundamental theory and principles at specific manufacturing concerns.

Most people in the field of industrial management have outlined what they considered to be the organic functions of control. Hamilton Church established three; Webster Robinson five; Harrington Emerson, five; and Ralph Davis, eight. The author of this text believes that there are six. They are: supplementary planning; scheduling; dispatching; instruction; progress surveillance; and correction.

A chapter is devoted to defining and discussing these six functions of control. They are the basis for expanding into text book form the actual case histories and discussion of production control, in general.

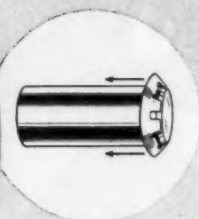
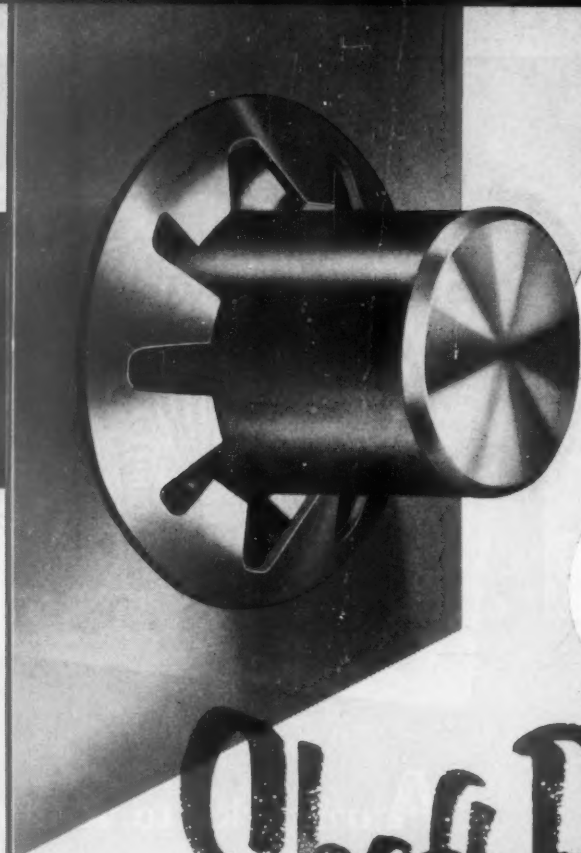
This 423-page text gives ample case histories of production control problems, and invites the reader to seek a solution to them. The case histories are not all in the large manufacturing, large employment class. Many cover production problems that have occurred in plants employing 100 to 500 people.

Two chapters in the book are devoted entirely to production control in intermittent manufacturing. One chapter gives the over-all information of intermittent manufacturing, problems inherent to such operations, and the role of production control. The second chapter deals with the specifics of control in these operations. Several case histories are discussed.

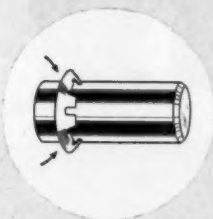
Another chapter of the book is devoted entirely to showing how a small company, that is, one which employs under fifty people, can meet the four demands of manufacturing through application of the six basic principles.

Production control is presented throughout as an integral part of the factory, with emphasis on the interrelationships between production control and the other functions of manufacturing.

Production Control may be purchased from Hitchcock's Book Division, Dept. AFE, Wheaton, Ill. It is priced at \$10.60 per copy.



Pilot teeth guide fastener on for easy hand starting.



Hardened spring steel teeth bite in, resist dislodging force.

for positive **Shaft Retention**

FASTEX[®] SPRINGRIP FASTENERS

Simplify assembly, save costs! Springrip Fasteners are simple to apply to rods and studs . . . assure exceptional strength without special preparation . . . no costly threading or drilling required. Standard Springrip Fasteners with pilot teeth now in stock and available for immediate delivery. Full details on all cost-saving Springrip Fasteners and other Fastex Shaft Retention Fasteners are found in new Fastex Catalog No. AF-9. This important booklet contains complete technical data, dimensions and application suggestions. Write for your catalog today!

Other FASTEX [®] Shaft Retention Fasteners			
FASTEX[®] Plect-Ring[®] Retainers Made of non-aging, chemical resistant vinyl . . . act as positive holding shoulder.	FASTEX[®] Push-On Fasteners Slip over studs, shafts, rods or bolts . . . held tight under pressure or vibration.	FASTEX[®] NC[®] Ring Retainers The fast, simple method for retention or spacing on rods or shafts . . .	FASTEX[®] External-Tooth Springrip Fasteners For use in tubes or bored holes . . . provide spring lock for positive retention.



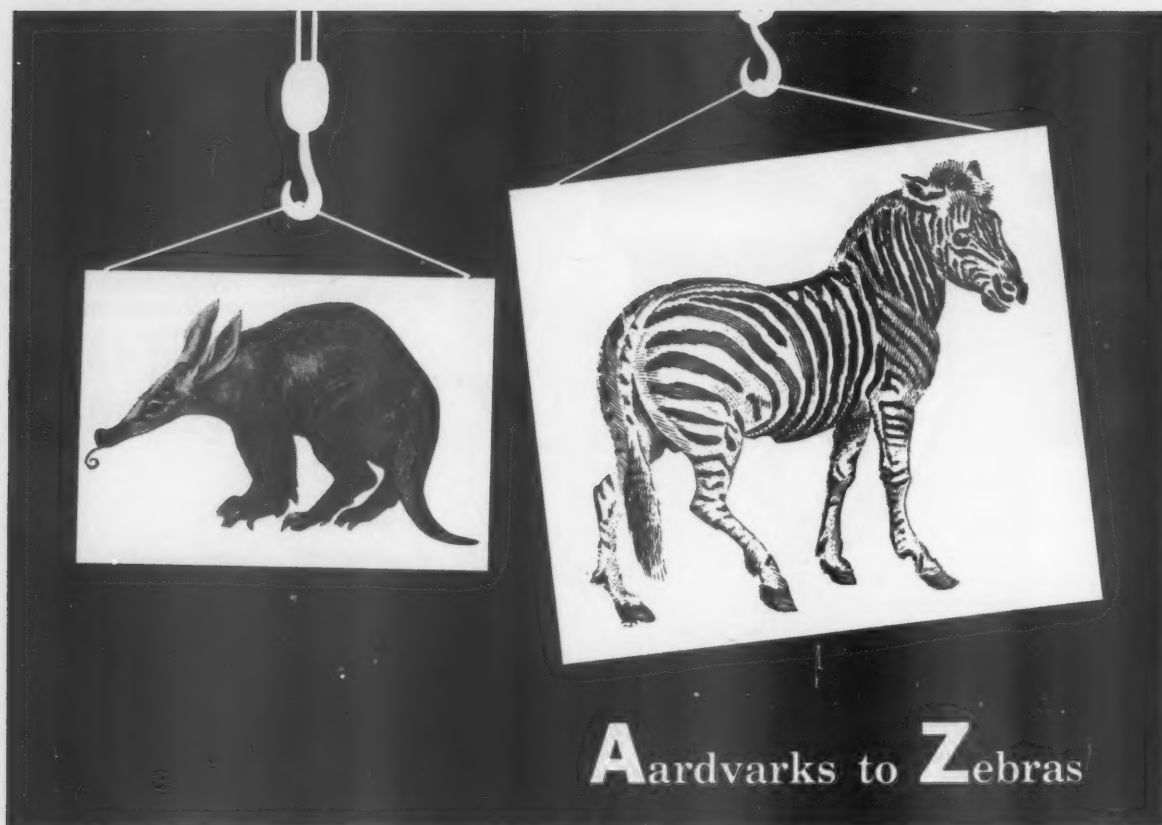
i

t

w

FASTEX

DIVISION ILLINOIS TOOL WORKS INC.
 195 ALGONQUIN ROAD, DES PLAINES, ILLINOIS
 IN CANADA: SHAKEPROOF/FASTEX
 DIVISION OF CANADA ILLINOIS TOOLS LTD.
 TORONTO, ONTARIO



Aardvarks to Zebras

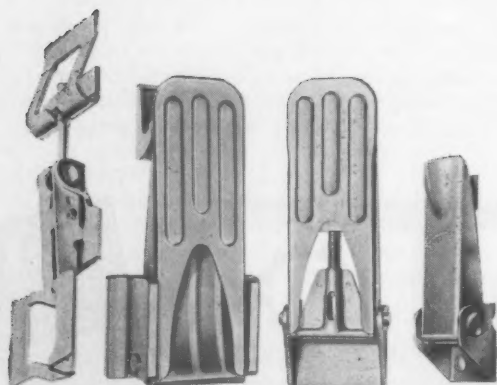
There's a Camloc Fasten/eered Universal Latch to do the job... and do it better!

You may never have to crate an anteater or ship a zebra. It's just one way of demonstrating the wide range of tensile strength requirements met by Camloc Universal Latches. For any job... from A to Z... 500 pounds or 4500 pounds... shipping containers or component assemblies of any size... Camloc can provide the latch to fill your specifications.

At Camloc the science of modern fastening is called FASTEN/ATION. And, FASTEN/EERED Camloc latches provide the ultimate in protection, ease of installation, and simplicity of operation. For example: draw hooks always stow flat when latches are open. Latches can't open under shock or vibration. Clean, crisp appearance enhances any product or component.

Have a special fastening or closure problem (even a reusable zebra case)? Camloc can provide a FASTEN/ATING solution. Write today for your copy of the full-line Camloc catalog.

specialists in fasteners for industry



37L — Ultimate tensile strength up to 4500 lbs. Short or long handle types.

45L — Ultimate tensile strength up to 1000 lbs. Aluminum or steel mounting bases and hooks.

46L (with adjustable draw hook) — All the features of type 46L plus draw hook adjustable over a $\frac{1}{2}$ " range.

51L — Ultimate tensile strength up to 500 lbs. Hook adjusts by simple rotation over $\frac{1}{4}$ " range.



CAMLOC FASTENER CORPORATION, 14 SPRING VALLEY RD., PARAMUS, N. J.
West Coast Office, 5455 Wilshire Blvd., Los Angeles, California • Southwest Office, 2509 W. Berry St., Fort Worth, Texas
European Subsidiary: Camloc Fastener GmbH, Kelkheim/Taunus, West Germany

Copyright 1961, Camloc Fastener Corporation

Use postpaid card. Circle No. 210

Publisher's Page

Not Later, NOW!

Industrial development by other countries throughout the world is rapidly accelerating. Because our own has not been reacting fast enough, we are faced with economic problems this country has not known for over one hundred years.

Even with our current industrial capacity, we have almost eliminated ourselves from some world markets. This is because our wage and salary dollars are a major part of the cost of our products and services.

Under such critical circumstances, it is incredible that labor wants "to share the work" by reducing the work week from 40 to 32 hours while maintaining a 40 hour pay schedule. Not only incredible, but ridiculous.

This is particularly true when other nations have a technology comparable to ours.

In the face of declining non-military world trade, we cannot afford to delay our decisions. We must get down to cases and improve our productivity to the point where we are again competitive.

Right now, our first and major job is to build a dynamic, expanding domestic economy. This is a job calling for the combined efforts of management, labor and government. It is a job which should concern each one of us. Without a sound American economy, the entire free world is in serious danger.

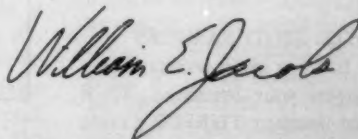
We must use all our knowledge, brainpower and enormous energy to regain our position of leadership in the industrial world.

Every American must be made aware of our industrial production and trade problems, and their relation to his job and his future. It is our traditional heritage, that when we do understand the problem, all of us give our best efforts to attain phenomenal goals.

Never mind the wage and salary increases, just for the sake of more money. There is a job which needs to be done. One which requires each of us to give an honest day's work for an honest day's pay.

We, as a nation, have proved to the world that our economic system and way of life can provide a standard of living without parallel in history. As a free people, we are not only willing, but anxious, to help other nations attain our high objectives for their people. The communists have yet to demonstrate any such honorable intent.

Our high economic standards are not a mere accident of time and place. The dreams of our founding fathers became a reality because we had found the means to permit each person to utilize his full productive capacity. It is our job now to further these means. If we fail, the failure will be ours, not the system's.



Publisher

WE BROKE A DOZEN SCREWS, BUT

we couldn't make this sheet metal insert spin in its hole!

THE INSERT PROBLEM

A hole punched in thin sheet metal doesn't provide enough surface for threading. You often have to supply the threads by installing an insert.

But the same hole doesn't provide much surface for *gripping*, either. The insert spins.

WHAT WE DID ABOUT IT

The insert we tested was designed with an *angular* knurl around a cone-shaped gripping perimeter. Here's what happened:

First: When we mated the sheets, put in a screw, and tightened it in the insert, the screw pulled the insert toward the sheet. It also pulled the teeth of the angular knurl more firmly into the edges of the hole, increasing their resistance to spin.

We broke screws (No. 8, 10, 12, and 1/4 sizes) by overtightening them. But the only effect on the insert was to tighten it.

Second: When the insert was first pressed into the hole, the angular knurl displaced metal, squeezing it toward and into a groove around the bottom of the insert. This locked the insert against being pushed out before the screw was tightened. After tightening, the lock was intensified by the added squeezing pressure of the angular knurl.

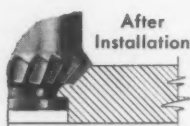
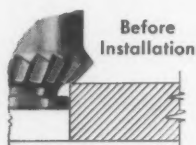
WE'LL SEND SAMPLES

If you've had this insert problem, drop us a line on your letterhead. We'll send some Southco THREDS (that's their name) for you to try. No obligation, of course. Write Southco Div., South Chester Corporation, 257 Industrial Highway, Lester, Pa.

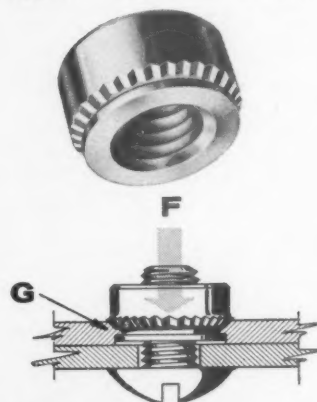
THREDS... AND THE ANGULAR KNURL PRINCIPLE

Southco THREDS are installed by pressing into a single hole in the sheet, provide thread length equal to or greater than that of a standard nut. One insert fits any sheet thickness (see minimum requirement, last column in table below). Material is case hardened steel, Cad. plated per Fed. Spec. QQ-P-416 Type II, cl. 2, yellow iridite.

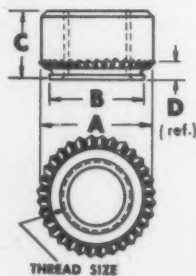
ANGULAR KNURL (detail)



Teeth bite into edge of hole, force metal into locking groove at base of insert.



Additional torque on screw increases force F, pulling teeth of angular knurl more firmly against sheet and putting extra pressure on metal in locking groove G.



SOUTHCO THREDSTM... SPECIFICATIONS

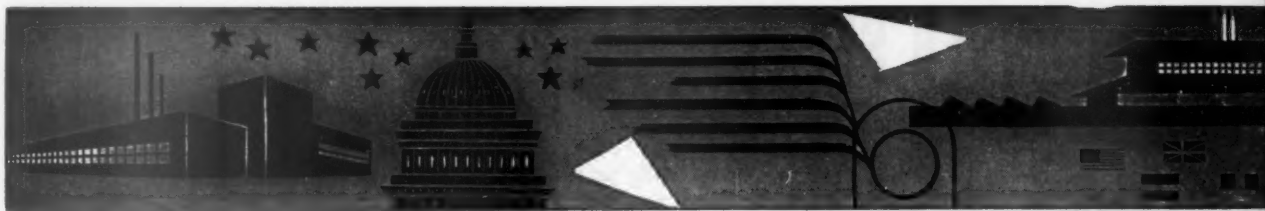
THREAD SIZE	PART NUMBER	A	B	C	D	Weight per M (lbs.)	Min. Sheet Thick-ness
4-40 NC	74-11-104-13	3/32	.185	3/32	3/64	1.22	
6-32 NC	74-11-106-13	3/32	.247	3/32	3/64	1.99	.036
8-32 NC	74-11-108-13	3/16	.278	3/16	3/64	2.87	
10-24 NC	74-11-110-13	3/16	.278	3/16	3/64	2.51	.048
10-32 NF	74-11-210-13	3/16	.278	3/16	3/64	2.53	
12-24 NC	74-11-112-13	1/2	.372	3/16	3/64	4.58	
1/4-20 NC	74-11-125-13	1/2	.372	3/16	3/64	4.28	.060
1/4-20 NF	74-11-225-13	1/2	.372	3/16	3/64	4.32	

© 1961

SOUTHCO FASTENERS
LION

Use postpaid card. Circle No. 211

The State of Business



PLANT EQUIPMENT AND DEFENSE

EXPENDITURES TO PACE 1962 ECONOMY

by Edward A. Sprague, Economist
F. W. Dodge Corporation

All major indicators of the national economic health are expected to advance in 1962. Some of them should set new records, according to the opinions of 316 economists surveyed by the F. W. Dodge Corp.

Most economists agree that increased spending for plant equipment and national defense will be the principal pacemakers in 1962.

Implicitly or explicitly, most of the economists indicated that their numerical projections were based on the familiar assumption that there would be "no shooting war" during the forecast period. Many of them qualified their assumption in their written comments.

As a short range stimulant, increased government spending was mentioned more times than any other single factor in the 1962 pattern.

However, economists also stressed that anticipated build-up of business inventories, particularly in durable goods, renewed strength in plant and equipment expenditures, despite excess capacity in many lines, were the prime non-government stimulants to a good business year.

Also cited were weak spots in the economy, which could act to dampen or distort business expansion during the year.

They were:

- Continued lagging consumer spending.
- Another sluggish housing year.
- A resurgence of inflation, which if severe enough could

lead to price and wage control.

- More aggressive foreign competition and renewed balance of payments problems.
- A continuing high level of unemployment.
- A "rift" between the Administration and the business community which could discourage investment and business morale.

The general feeling of most economists can be summed up in the words of one economist in the manufacturing field who wrote, "The outlook is bright, but disappointment is in store for those who let their optimism become too strong."

GROSS NATIONAL PRODUCT

The average expectation of the economists is that GNP, in current dollars will rise steadily throughout the period but with some slight slackening in the rate as the business recovery matures. The median estimate of GNP at seasonally adjusted annual rates ran from \$552 billion in the second quarter of 1962, to \$565 billion in the last quarter.

A special analysis of individual replies to this question reveals a fairly widespread agreement on the direction of GNP by each quarter of the forecast period. Seventy-seven percent of the economists expect GNP to increase in each of the four quarters.

INDUSTRIAL PRODUCTION

The median forecast calls for a seasonally adjusted Federal Reserve

Board index of 116 by December 1961, picking up to 120 by June 1962, and reaching 122 in December 1962. Seventy four percent of the economists expect the index to rise throughout the forecast period and 13 per cent foresee a rise followed by a dip before the end of next year.

Many of the economists thought the increase in industrial production would be sparked by the durable goods sector. The defense build-up and a better automobile year were considered important contributors to the uptrend in durables.

WHOLESALE PRICES

The median estimate of the wholesale price index for December, 1962 settles on 120.8 which would represent a 2% increase from last June.

Reasons given for some resurgence in wholesale prices, after more than three years of comparative stability, include the defense build-up, expected strengthening in farm product prices, and the general economic recovery.

CONSUMER PRICES

"More of the same" is the almost unanimous feeling of the economists in regard to the trend in consumer prices. The consumer price index stood at 127.6 in June 1961, and the median forecast is that it will rise 2.5% to 130.2 by December 1962. Only one per cent of the economists thought the price level at the end of 1962 would be down from the mid-1960 mark.

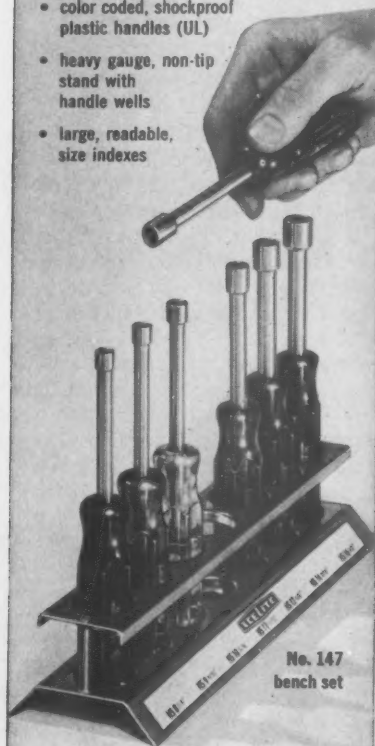
Although few economists pre-

continued

"MATCHED" NUTDRIVER SET

hollow shaft . . . color coded
... every tool in its place

- 7 popular sizes 1/4" thru 1/2"
- hollow shafts for extra clearance
- precision fit, case-hardened sockets
- high carbon steel: chrome or nickel plated
- color coded, shockproof plastic handles (UL)
- heavy gauge, non-tip stand with handle wells
- large, readable, size indexes



OTHER SETS, TOO: solid-shaft, hollow-shaft, or mixed . . . bench and wall rack models

PLUS FULL RANGE OF SEPARATE
NUTDRIVERS: 3/32" thru 3/4" - regular, stubby, extra-long, midget (pocket clip)

available through leading electronic
and industrial distributors

XCELITE, INC. • ORCHARD PARK, N. Y.
Canada: Charles W. Pointon, Ltd., Toronto, Ont.

XCELITE[®]

HAND TOOLS

QUALITY SCREWDRIVERS, NUTDRIVERS, PLIERS,
WRENCHES, SERVICE KITS, and SPECIAL PURPOSE TOOLS

Use postpaid card. Circle No. 212

Business, continued

dicted the price "creep" would turn into a "gallop," inflation is expected to be more of a problem next year. Defense spending, domestic politics, and the rising cost of services were blamed for part of anticipated increase.

TOTAL NEW CONSTRUCTION

The majority of economists look for a good year in total new construction. On a seasonally adjusted annual rate basis, the median estimate of the work-in-place series rises steadily from \$57.8 billion in the second half of 1961 to \$59.8 billion in the second half of 1962.

One economist thought that construction of fall-out shelters "may become significant enough to increase 1962 volume by a billion or more dollars . . ."

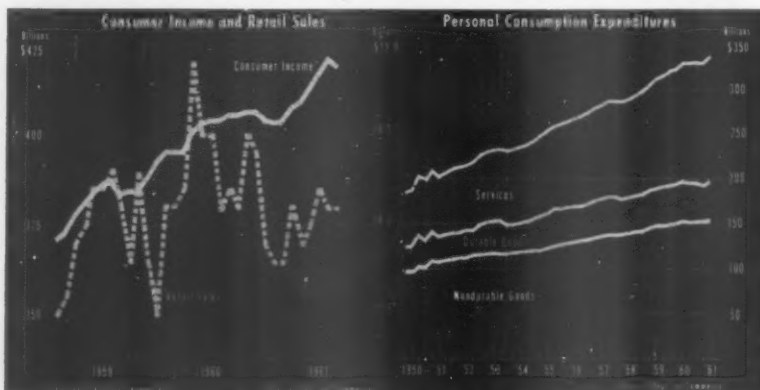
NEW HOUSING STARTS

Of all the major indicators, new housing starts created the least enthusiasm among the economists.

The Median forecast calls for a rate of 1,300,00 during the first half of 1962, then a very slight rise to 1,325,000 in the last half.

AVERAGE HOURLY WAGES

There is nothing in the offing to halt the upward movement in average hourly wages. This is the almost universal opinion of the economists. In fact, not a single economist thought wage rates would decline in any of the major categories: durable goods manufacturing, non-durable goods manufacturing, and building construction. Some economists felt the continuing upward



Despite rise in income, retail sales remain at low levels. Consumer spending, however, continues to rise to new products as a result of spending for services. (Courtesy First National Bank of Chicago).

NEW PLANT AND EQUIPMENT

Most of the economists expect a rising trend in plant and equipment expenditures in 1962. The median forecast of such expenditures at seasonally adjusted annual rates advance from \$35.5 billion in the fourth quarter of this year to \$36.8 billion for the first half of 1962 to \$37.6 billion for the second half. This would put 1962 capital spending slightly above the previous record year of 1957. Actually, there were 21 economists who thought that capital spending would top \$40 billion for the second half of next year.

Because of excess capacity in many industrial lines, the major part of the growth in capital spending is expected to occur in the equipment sector.

trend in wage rates would moderate somewhat owing to increased foreign competition, the relatively high level of unemployment, and some "stiffening" on the part of management negotiators.

PERSONAL EXPENDITURES

According to the average anticipation of the economists, expenditures will be at a seasonally adjusted annual rate of \$340 billion during the second half of 1961. Thereafter, they will climb steadily to \$350 billion for the first half of 1962 and \$360 billion for the second half.

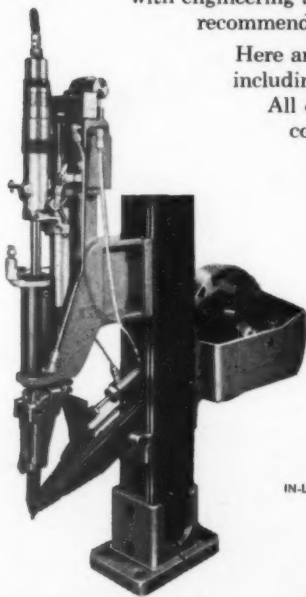
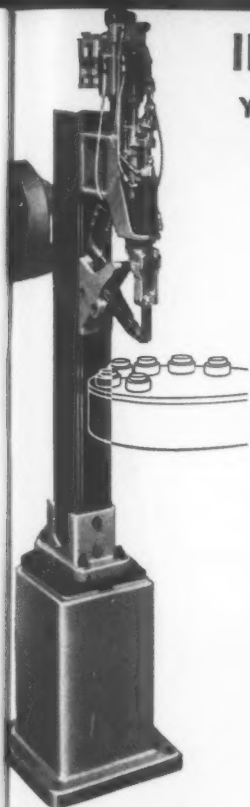
Quite a few economists commented that the consumer may not be in a spending mood next year, at least, not in a mood to support a boom in durable goods which many economists are forecasting. •

IF YOU HAVE A SMALL-PARTS ASSEMBLY PROBLEM...

You can look to DIXON machines and components for a profitable solution

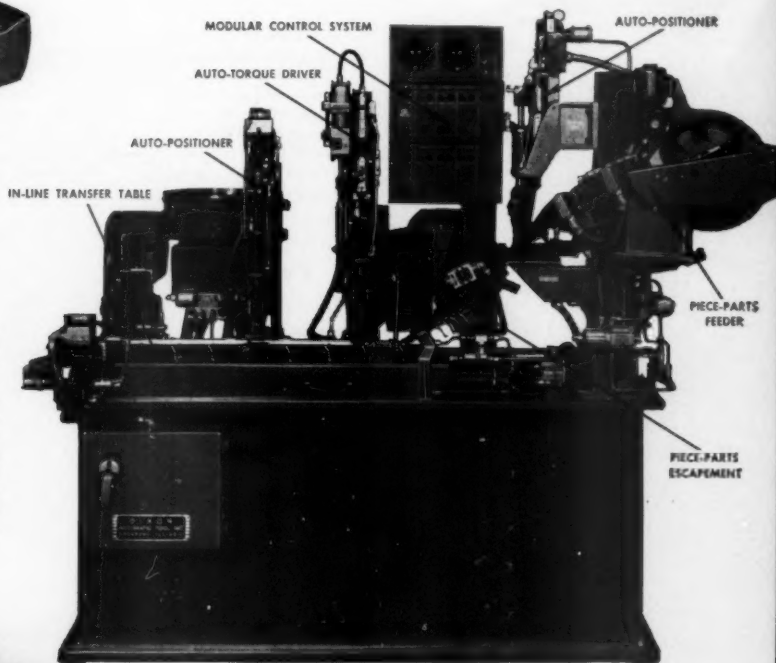
By turning to Dixon, many manufacturers have found solutions to their assembly problems, resulting in important cost reductions. A complete design-and-build service is available, with engineering and field service direct from the factory. You can depend on Dixon to recommend the proper equipment for your project.

Here are shown standard machines and components for assembly operations, including screw driving, feeding, escaping, and controlling various operations. All components are easily tooled for the parts to be handled, and can be combined in one coordinated piece of equipment to handle the assembly of several parts. An example of this is the machine, shown below, which utilizes a number of Dixon Standard Components for the assembly of five parts for a telephone relay component.



AUTO-POSITIONER This parts-placing machine, with its exclusive automatic sensing device, simplifies small parts assembly operations. It can be furnished as a completely automatic station for use at a dial or straight-line transfer table, or it can be utilized as a single-station machine, fixtured for many secondary operations. The sensing device stops the machine if a part is missing or improperly placed. Handles piece parts from $\frac{1}{8}$ " to 2" approximate size.

AUTO-TORQUE DRIVER This automatic screw-driving machine has many exclusive features, which make it reliable and efficient. It drives screws and nuts to a precise torque with gentle and positive control. Shown here as a fully automatic station for use at a dial or straight-line transfer table, it can also be furnished as a pedestal model with work table and a foot treadle to initiate the cycle. Range for screws and nuts in sizes from No. 2 screw to $\frac{1}{4}$ " diameter.



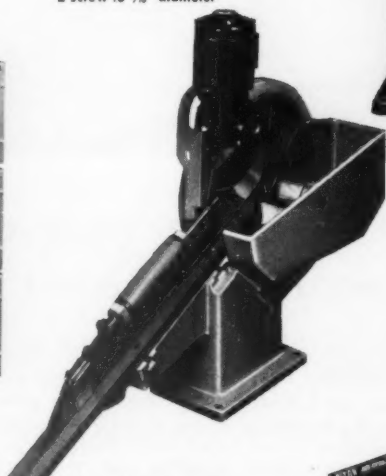
STANDARD COMPONENTS USED ON MACHINE FOR 5-PART ASSEMBLY OPERATION

This ingenious Dixon Machine automatically assembles five parts to form a telephone relay component. Essentially, it consists of a transfer table, five feeders, three assembly heads, pin inserting and staking mechanisms, and full sensing equipment. Pointed out on the machine are the standard components for the assembly operations and the Dixon Modular Control System. The use of these standard components represents important savings in the cost of this type of machine.



MODULAR CONTROL SYSTEM

A great variety of machines can have precise and dependable electrical control by means of the Dixon Modular Control System. The controls are constructed with plug-in modules. A standard module controls one action and provides pilot lights and manual push-button control for that action. The manner of connecting determines the cycle. Any sequence of operations can be controlled and interlocked. Provides important savings in space and materials.



PIECE-PARTS FEEDERS

Dixon Feeders are very compact, easy to tool, and have the optional use of a divided track with T-slot adjustment. Illustrated is the FE-101-M without tooling, but with an ES-9 parts escapement. When motor drive is not required, the drum is actuated by the air-operated escapement. The feeder has 140 cu. in. of storage capacity, with larger sizes available. All Dixon Feeders have straight tracks for optimum control of piece parts. Can be furnished either untooled or fully tooled for the job.

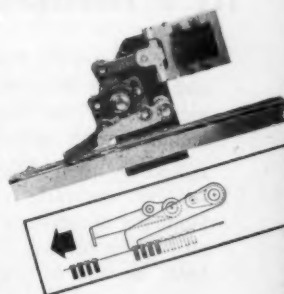


Write for Descriptive Literature or Special Information

Tell us your requirements. No charge for recommending and quoting Dixon Tooled Components.

Use postpaid card. Circle No. 225

PIECE-PARTS ESCAPEMENTS In addition to the escapement shown on the feeder to the left, other types are available for solenoid, air or mechanical operation. They are designed to handle a broad range of parts at rates up to 250 per minute. These dependable standard units save engineering and construction time and have the advantage of replacement parts being available from stock.



DIXON AUTOMATIC TOOL, INC.

2309 - 23RD AVENUE • ROCKFORD, ILLINOIS

TECHNICAL DATA

FOR THE MANUFACTURE OF

PHILLIPS

CROSS-RECESSED HEAD SCREWS

In the interest of product dependability, which comprises not merely uniform appearance, but particularly maintenance of accuracy as to dimensions, contour and resultant physical characteristics of strength, torque, toughness and other related operative qualities, important alike in production, inspection and service, the technical data herein contained is made available to manufacturers and users of Phillips Cross-Recessed Head Screws through the cooperation of

SCREW RESEARCH ASSOCIATION

FOR LIST OF MEMBERS SEE NEXT PAGE

Your constant protection against "mis-mates" in Phillips Cross-Recessed Heads and Drivers

To make sure the Phillips Cross-Recessed Head Screws and Drivers they produce will be "precision-mated", members of the Screw Research Association govern manufacturing operations with this 221-page manual.

Issued by their Engineering Standards Committee, it supplies complete engineering and production data. Standard dimensions and tolerances are prescribed for all Phillips screws, drivers and bits, and manufacturing tools, as well as inspection procedure and equipment.

New information is added regularly to this manual, as

new techniques are developed by Phillips engineering research. These often permit even closer tolerances, and are adopted by all Association members to further improve Phillips Screw and Driver performance.

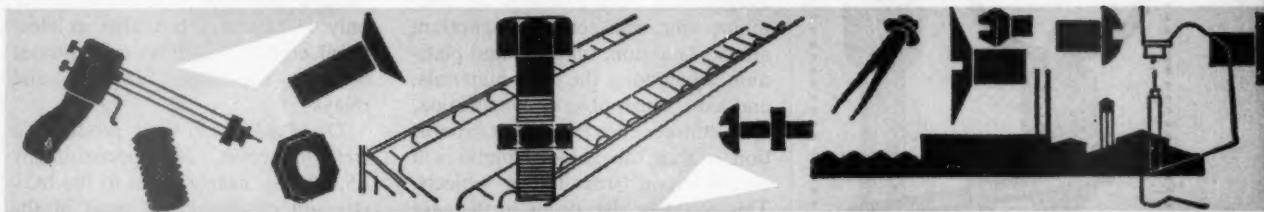
This progressive, exacting quality-control is a big reason why the Phillips Recessed Head is now by far the first choice for fastening economy. Are you using Phillips Screws everywhere their many advantages can pay off in additional cost reduction? Why not make a "Phillips savings survey" of your assembly operations?



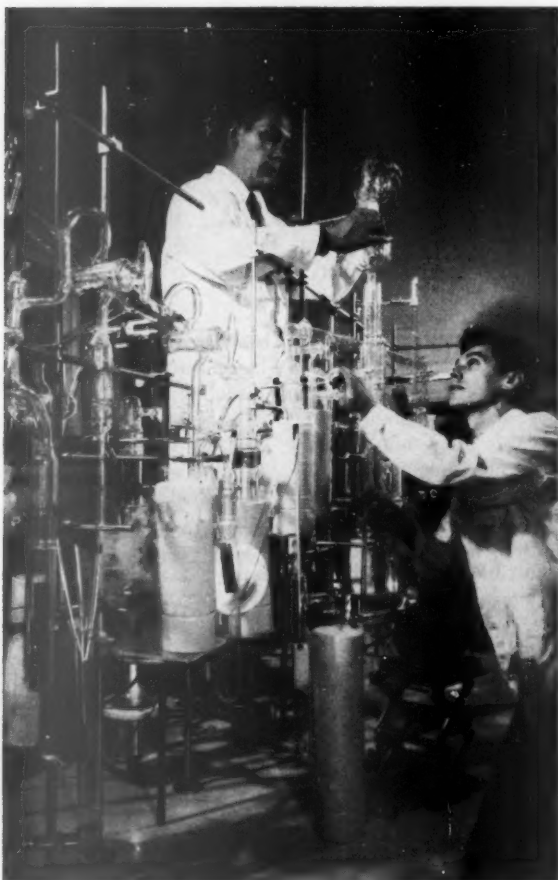
SCREW RESEARCH ASSOCIATION

Use postpaid card. Circle No. 214

Ideas and Field Reports



STUDIES EFFECTS OF VACUUM ON METALS



Complex of glass tubing, vacuum chambers and frosty liquid nitrogen traps provides simulated "space ride" for electronic components, material samples and other specimens. Researchers Richard H. Suess (II) and George R. Neff assemble a portion of the equipment that will reproduce the nearly pure vacuum found on the moon.

To study the effects of space environment on materials, Hughes Aircraft Co. of Culver City, Calif. has fabricated a "vacuum train" apparatus which reduces air pressure to 10^{-12} atmosphere. Experiments on the equipment have brought to light a host of new and perplexing problems with which engineers will have to contend when designing equipment to operate in space.

One of the strange effects of super vacuum on material is metal evaporation. Studies show that whole sections of a space vehicle might "disappear" during an extended space voyage, if the wrong metal is used in construction.

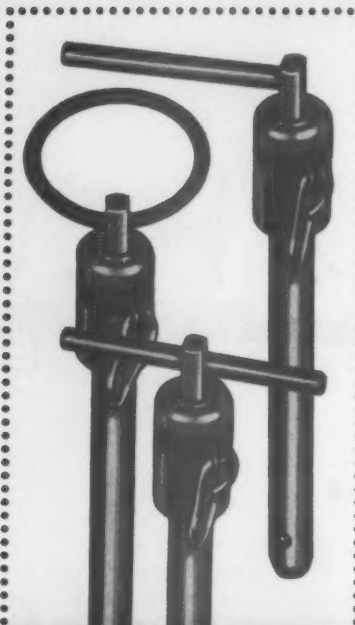
Other specific problems being studied are:

Vaporizing of grease and other lubricants.

"Cold welding" of metals in contact with each other. This becomes a fact in a matter of days in the absence of air. It occurs after layers of adsorbed gases and impurities have been evaporated. Bare atom can then contact bare atom and metals attach to each other as securely as a welded joint.

Some tough plastics, such as vinyl, grow brittle and lose strength due to evaporation of their plasticizer. In other cases, high vacuum "protects" plastics. Teflon, for example, crumbles to powder when exposed to radiation in earth's atmosphere. At Hughes, irradiation was performed in ultra-high vacuum, and it was found that teflon retains its strength.

continued



**DESIGN,
PERFORMANCE,
RELIABILITY...**

LOCKWELL

DOUBLE ACTING QUICK RELEASE PINS

As a companion to the Lockwell single-acting quick release pin this NEW double acting pin provides these features which have made Lockwell fasteners the quality line.

DESIGN Clean, smooth lines with closed construction eliminating the possibility of dirt collecting in openings.

PERFORMANCE Brazed construction made economically possible by special equipment allows for higher tension loads and greater versatility.

RELIABILITY Positive locking and instant release are provided by simple push-pull action.

Hartwell Lockwell Double Acting Quick Release Pins are designed to meet NAS Specifications. Available in both 2 ball and 4 ball types with a choice of 3 handle styles. Let us consult with you on special application and design problems.



THE HARTWELL CORPORATION

9035 VENICE BLVD., LOS ANGELES 34, CALIF.

BRANCH OFFICES: • CHICAGO • CLEVELAND • FORT WORTH • HACKENSACK • SEATTLE • WICHITA

Use postpaid card. Circle No. 215

Ideas and Field Reports, continued

In tests it was found that certain anodic coatings can reduce evaporation rates by as much as 70 times.

The metals most susceptible to evaporation were found to be cadmium, zinc, and certain magnesium alloys. Titanium, tungsten and platinum are among the best materials, and least susceptible to evaporation.

A consequence of metal evaporation is that the gaseous metal will condense on surrounding objects. This could be disastrous in the case of an electronic circuit which was assembled with cadmium plated screws. The evaporated cadmium, depositing on wiring and components could cause the circuit to "short."

A more severe problem is the evaporation of lubricants and adsorbed layers of gas on bearing surfaces and the resulting seizure, or "cold weld." The problem arises not only in bearings but also in electrical contacts such as commutator brushes, slip rings, switches and relays.

One "cold weld" test produced a weld junction of approximately 45,000 psi, nearly equal to the bulk strength of metal rod used in the test.

The studies are part of a space environment research program under way in the components and materials laboratory of the Hughes aerospace group.

NEW CONSIDERATIONS FOR USE OF HIGH STRENGTH BOLTS

The use of high strength bolting for shop connections, as well as field assemblies, is receiving greater consideration by structural steel fabricators, according to Edward R. Estes, Jr., chief engineer for the Florida Steel Corp.

Speaking at the American Society

of Civil Engineers meeting in October, he pointed out that recent research studies showed no reduction in beam strength when high strength bolt connectors were used. Also, the new high strength bolts and new specifications governing their use has given greater impetus to bolt use in shop fabrication.

TANDEM PRESS SPEEDS AUTO ENGINE ASSEMBLY

A tandem press installation allows semiautomatic assembly of cam bushings and fully automatic pressing of welsh plugs into water jacket holes of auto engine blocks.

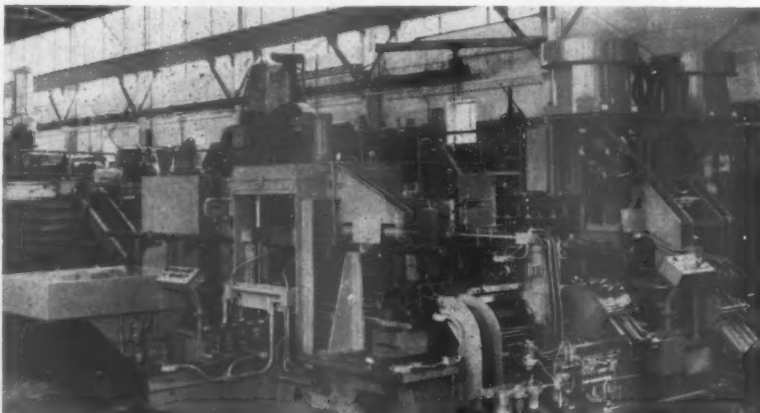
Designed by engineers of Detroit Broach & Machine Co., the system permits runs of either V-6 or V-8 cylinder engine blocks to be processed

through the same line without resorting or retooling.

In operation, engine blocks coming off the machining and transfer line are moved up to the first press.

The first machine brushes out two oil gallery holes on each block, blows them out, and blows out the

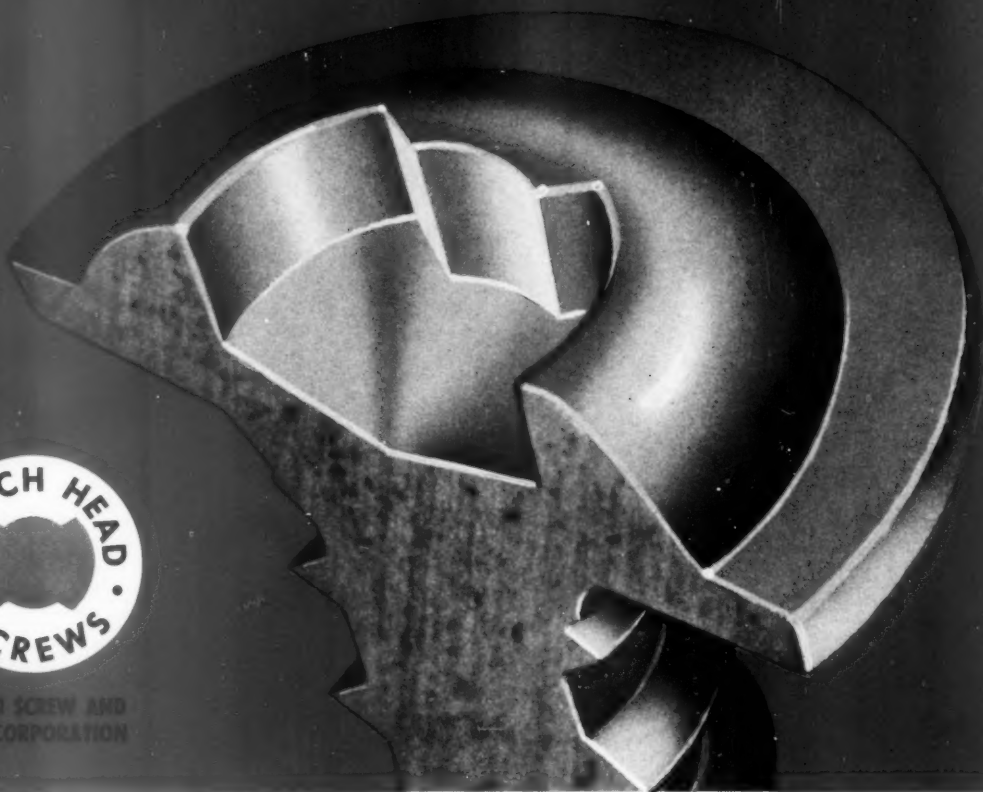
continued



Tandem press setup for cam bushing assembly and welsh plug pressing. It can handle cast iron V-6 engine blocks, and can be converted to process V-8 blocks without retooling.



UNITED SCREW AND
BOLT CORPORATION



flowability IS THE SECRET!

BIG HEAD—LARGE BEARING WASHER—THIN SHOULDERS—DEEP, WIDE RECESS—STRAIGHT WALLS—SHARP CORNERS—these are tough specifications that prove the flowability of wire. To successfully produce this fastener requires them all. This is why United Screw and Bolt Corp., Chicago, Illinois, specifies Keystone Special Process Wire for this screw.

K. F. Schmidt, Purchasing Agent for United, says, "We need a wire that gives us improved die life and longer runs. Our

experience shows the flowability characteristics of Keystone Wire permit us to cold head exactly to specifications. We find the uniformity of Keystone Wire assures successful production of these clutch head fasteners."

It will pay you to investigate the flowability of Keystone Wire. This may give you that extra advantage you need to cold head more difficult jobs—get greater production—reduce machine downtime—increase die life—make more profit. We'll help you find out.

See Postpaid Card. Circle No. 308

Keystone Steel & Wire Company, Peoria, Illinois

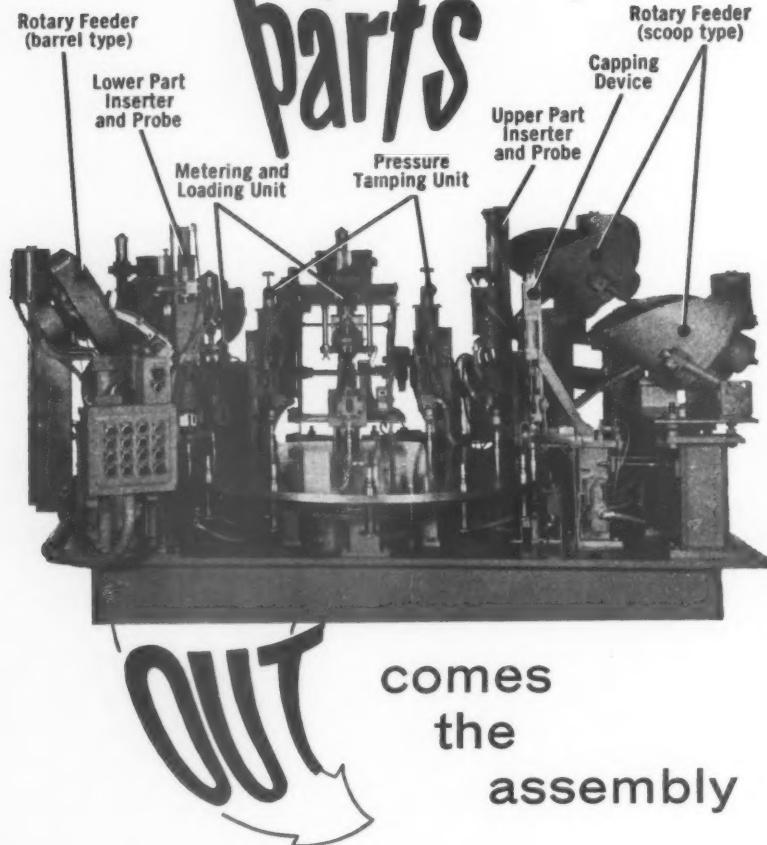
KEYSTONE

WIRE FOR INDUSTRY

MADE AT PEORIA, ILLINOIS, U.S.A.



in go the parts



**faster . . . better . . . at lower cost with a
DPS special assembly machine**

Micro-parts, or parts many, many, times their size . . . parts of almost any shape or material go together fast, automatically, and accurately in DPS special assembly machines. DPS experienced engineers will combine rotary feeders . . . vibratory feeders . . . elevating feeders . . . and power screwdriving machines with other processing equipment to feed, orient and assemble parts. If you have an assembly problem, let a DPS engineer analyze your production line. DPS special assembly and processing machines can give you higher-speed production . . . better quality control . . . and substantial reduction in assembly costs. Write today.



DETROIT POWER SCREWDRIVER CO.

A Subsidiary of Link-Belt Company

Selective Parts Feeders; Screw, Nut and
Stud Driving Machines;
Special Purpose Assembly Machine:

2815 W. Fort Street
Detroit 16, Michigan
T Ashmo 5-3070

Use postpaid card. Circle No. 216

Ideas and Reports, continued

cam bushing holes. It then presses in four cam shaft bushings, previously loaded on the pressing lances of the machine by the operator.

The second machine is completely automatic in operation. It receives the blocks from the first machine and presents them progressively for the application of sealer compound and insertion of welsh plugs.

The stations are arranged so that the sealer compound is spun into the id's of the water jacket holes in metered amounts. Then the hopper-fed welsh plugs are pressed into the holes.

Each work station has locating and clamping devices to insure proper block alignment.

GEAR ANALYZER MAKES 3 PRECISION MEASUREMENTS

A rolling fixture type of gear analyzer uses inertia principles and electrical indicators to provide three simultaneous precision measurements of gear tooth accuracy. The unit has been developed by National Broach & Machine Co.



To analyze a gear, the analyzer is first set up with master pitch cylinders. Then the master gear is mounted in position. A work gear is lowered over its mounting shaft and meshed with the master gear. At the bottom of its downward motion, the work gear actuates a cycle switch that energizes a timer to delay checking until the work gear completes one revolution. The gear is analyzed on the next revolution.

The unit will give simultaneous measurements, all indicated separately, of work gear tooth eccentricity, tooth-to-tooth variation and tooth oversize and undersize conditions. It will detect nicks on tooth profiles as small as .0005".

continued

Assembly & Fastener Engineering



EATON-RELIANCE WILL INTRODUCE AN EXCITING NEW FASTENER IN JANUARY SEE IT AT THE DETROIT SAE SHOW

Eaton Manufacturing Company • Reliance Division • Massillon, Ohio

Use postpaid card. Circle No. 217



GRIPCO GUS never forgets!...

Applications, that is. Thousands of them. Like this one: manufacturer was using bronze alloy nut, drilling through nut and stud and driving a pin to keep nut in place for a disc hinge connection. Gus looked into the problem, suggested Gripco* Toplock Nut in commercial brass. Tests proved the change perfect. Big saving in going from bronze to commercial brass and in eliminating the drilling of nut and stud, plus driving pin. No more breakage of small drills!

Could GRIPCO GUS and his application-savvy help you? There's one right in your own backyard, you know... and his services are free. You'll find him listed in the yellow pages under Bolts & Nuts as the GRIPCO representative (he'll be using his assumed name there).

Some of GUS' GANG:

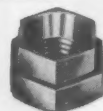
GRIPCO CENTERLOCK NUT: Locking feature in the center for fast feeding. Can be applied from either end.



THE GRIPCO PILOT-PROJECTION WELD NUT: (3 or 6 projections) is designed for easy, quick positioning. The circular pilot automatically centers nut in hole of appropriate size, in part. No need for expensive jigs or centering devices. Pilot helps prevent weld spatter from entering nut threads. (With and without lock)



GRIPCO CLINCH NUT: With or without self-locking threads. Hex collar prevents turning when torquing bolt.



Also available for immediate delivery: complete stock of Toplock, Open and Closed End Cap, Pilot-Projection Weld, Washer, Hex-Finished, Heavy Nuts, Self Piercing Clinch Nuts and Specials. 20-page Catalog on request.

*GRIPCO is a registered trademark of Grip Nut Co.

GRIP NUT COMPANY

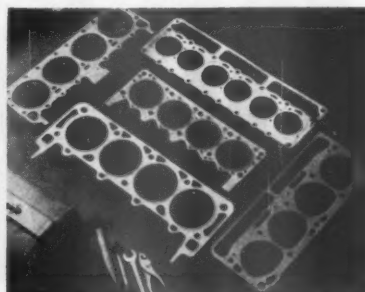
Subsidiary of Heli-Coil Corporation,
Danbury, Conn.

212 Maple Ave. • South Whitley, Ind. • Phone: South Whitley 723-5111

Use postpaid card. Circle No. 218

INCREASE AUTOMOTIVE USE OF STAINLESS HEAD GASKETS

Cylinder head gaskets made of stainless steel are beginning to find installation in the newer passenger automobiles.



The increased use resulted from good performance records on large motor truck engines.

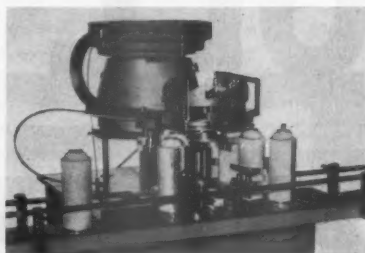
The gaskets, produced from Allegheny Ludlum Steel Corp. type 430 stainless steel, are made by the McCord Corp.

The high corrosion-resistant qualities and strength of stainless steel make it a strong favorite for cylinder head gasket use, and for manifold heat shield gaskets.

The gasket is embossed or imprinted with beads or rings. When the head and block are tightened against the gasket, the beads effect a seal.

According to the manufacturer, the stainless steel gaskets will last the life of the engines on both trucks and passenger automobiles.

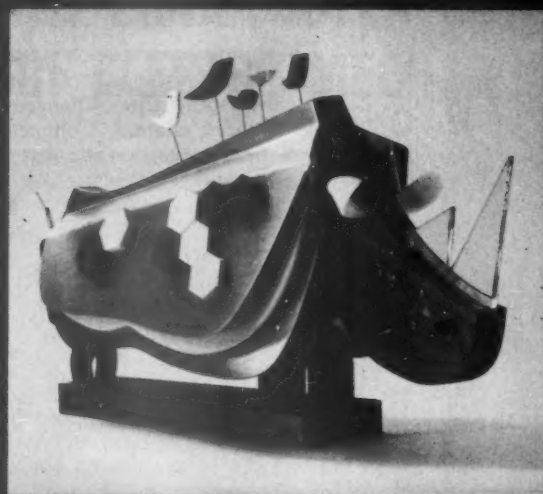
SPRAY TIP APPLICATOR SPEEDS PRODUCTION RATE



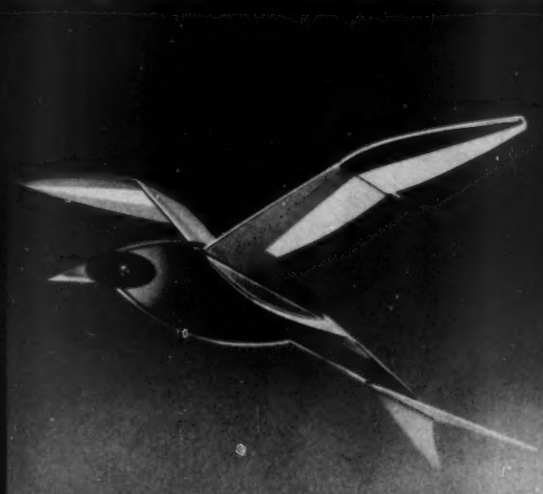
An automatic spray tip applicator, made by Haumiller Engineering Co., applies buttons to aerosol valves at the rate of 160 buttons per minute. The rate of assembly is about six times as fast as manual assembly.

continued

Assembly & Fastener Engineering



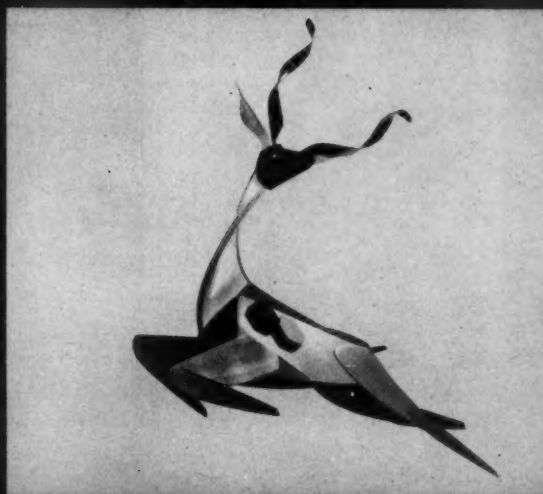
STRENGTH



LIGHTNESS



THRIFT



DESIGN

...get them all with 3M Adhesives!

The formulated talents of 3M Brand Adhesives can emphasize any one of a variety of fastening properties, depending upon which is crucial for the particular job at hand. But all offer the following advantages...

STRENGTH for example. SCOTCH-WELD® Brand Structural Adhesives create bonds that often are stronger than the materials joined! They distribute stress loads uniformly, with flexibility that resists vibrational fatigue. Fastening holes are eliminated, material integrity is preserved, joints are sealed against corrosion.

LIGHTNESS adds appeal! 3M Adhesives increase product appeal, save freight and handling costs, help take pounds off today's metalworking prod-

ucts. They eliminate mechanical fasteners, increase the strength of a lightweight assembly by distributing stresses evenly over a wide area.

THRIFT is a bonus. Many operations are eliminated, e.g., hole-making, countersinking, heat treating. No bolting, riveting, stapling, welding, brazing, sealing to do!

DESIGN freedom: Parts are fewer, assemblies simpler, unions stronger, using 3M Adhesives. You have a wider

choice of materials, because 3M Adhesives bond practically any kinds of materials to themselves or other materials, e.g. aluminum, brass, ceramics, copper, glass, magnesium, permanent magnets, plastics, steel, stainless steel, wood.

What sticky problem of design, production, or sales can these modern adhesives help you solve? Why not call in your nearest 3M Field Engineer for consultation? Or write: AC&S Division, 3M Company, Dept. SBZ-121, St. Paul 6, Minn.

"SCOTCH-WELD" is a Reg. T.M. of 3M Co. © 3M Co., 1961

ADHESIVES, COATINGS AND SEALERS DIVISION

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

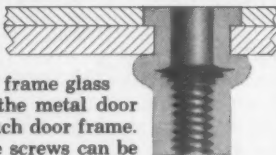
Use postpaid card. Circle No. 219





RIVNUTS® make sturdy nutplates for door hinges

Corridors of the new Atlanta Merchandise Mart are lined with attractive display rooms. The modular partitions, designed by Shower Door Company of America, use aluminum extrusions to frame glass and doorways. Sturdy nutplates are provided in the metal door jamb by installing twelve RIVNUTS® fasteners in each door frame. RIVNUTS® provide several threads so that hinge screws can be fastened securely. These fasteners are ideal for nutplates in thin material. RIVNUTS® are one-piece blind rivets with internal threads. To see if they can help on your fastening problems, please send a print of your part. For bulletin, see *Sweet's Product Design File*, or write Dept. AE-12, B.F. Goodrich Aerospace and Defense Products, a division of The B.F. Goodrich Company, Akron, Ohio. In Canada: Kitchener, Ontario.



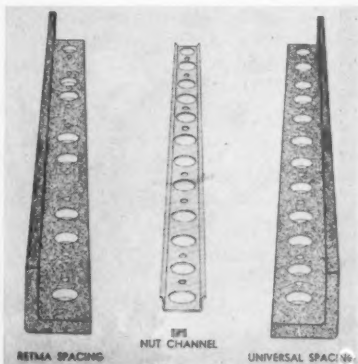
Use postpaid card. Circle No. 220

Ideas and Field Reports, continued

The unit features a quick change-over, enabling it to handle all popular valve spray tips. Changeover time is three minutes. Completely automatic in operation the tips are applied only when cans are in position. Self-adjusting for height and self-leveling, the applicator applies each tip firmly, reducing returned goods to a minimum.

UNIVERSAL NUT CHANNEL CUTS CABINET COST

An interchangeable nut channel developed by Standard Pressed Steel Co. eliminates the need for tapping most holes in sheet-metal cabinets for mounting of panels and other accessories. The result is simplified installation of much electrical, electronic and instrumentation equipment.



New nut channel reproduces on one strip hole spacings of both widely used industry standards, the Universal and the Retma.

The channel reproduces on one strip the sheet-metal hole spacings of both widely used industry standards, the Universal and Retma.

Standard length of the channel is 70½". The hole pattern is such that segments as short as 1¾", and larger multiples can be cut from the strip.

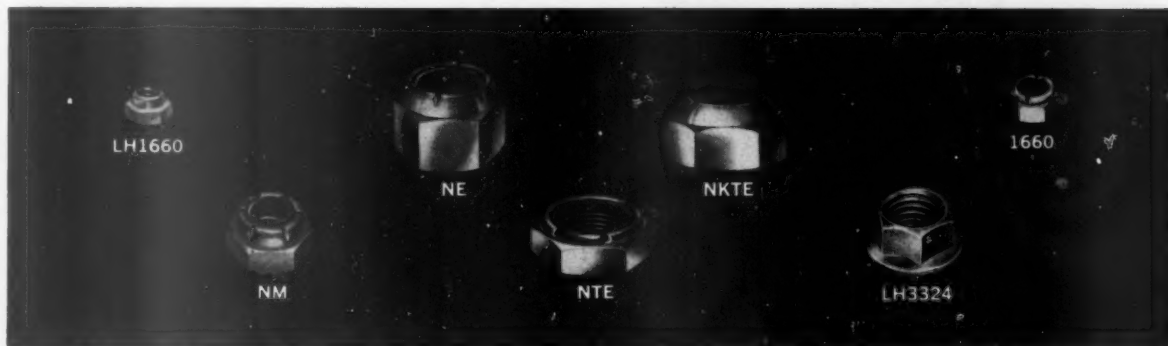
The channel is installed in cabinets by either bolting, riveting or welding. By aligning the first hole, all holes are accurately aligned.

UNDERGROUND METERS KEPT DRY BY EPOXY SEALING

Installing glass in water meters requires an excellent bond between the glass and the bonnet under any circumstances. Keeping underground meters in good working

continued

17 ESNA FASTENER SOLUTIONS FOR HUNDREDS OF ELECTRO-MECHANICAL SYSTEM APPLICATIONS



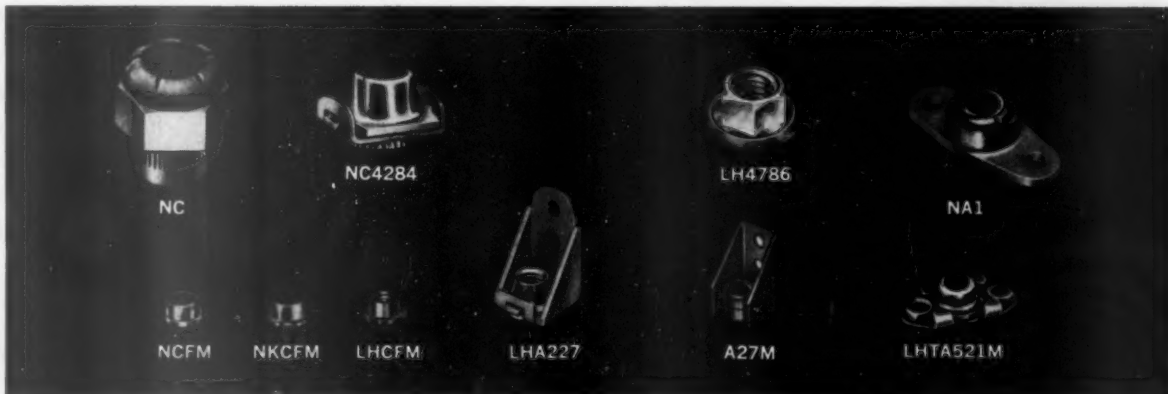
HEX TYPES

ESNA hex nut thread sizes range from a miniaturized 0-80 through standard SAE 1½"-12—and up. Designers have a choice of two types of reliable self-locking devices—depending on operational temperatures. Both types have received military approval and most parts are produced in carbon and stainless steels.

For temperatures up to 250° F., the high-reuse nylon insert type is recommended. For temperatures of 550° F. or 900° F. and higher, the all-metal offset closure provides excellent self-locking results. Nylon

insert nuts can be reused a minimum of 50 times on a standard screw and still retain locking torque. Nylon will not gall bolt threads or peel cadmium from the screws to foul or short vital circuits. Its dielectric strength and volume resistivity are extremely high. Nylon caps, available in most configurations, prevent "corona" effect, seal bolt ends, protect wires from chafing on bolt edges.

All-metal nuts using ESNA's elliptically offset locking device provide excellent re-usability because of their high hardness.



CHASSIS TYPES

Clinch types fasten to chassis or console by single hole mounting. Available in standard sizes and in new miniature flush mounting types; both all-metal for 550° F. temperature and with special nylon inserts for 350° F. operating environments. Also a new floating clinch nut which gives the economy of single hole mounting plus float to compensate for minor screw or component misalignment. Both standard and miniature clinch types are available with nylon caps. For other "black box" uses there are miniature right-angle "floaters," heavy

duty fixed anchors for drawer slides. There is also type LH4786, a new captive washer electric terminal nut.

The new ESNA catalog no. 960 shows the hundreds of configurations—with nylon inserts, nylon caps, or in all-metal designs—of ELASTIC STOP® nuts that are available as standard parts. Why not send for your copy today? We'll be glad to send sample nuts for testing, too. Just specify type and size. Write: Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, New Jersey. Dept. S60-1297.



ELASTIC STOP NUT CORPORATION OF AMERICA

Use postpaid card. Circle No. 221

INDUSTRY'S MOST PRODUCTIVE LINE



... pioneer in "One-Shot" Torque Control Tools for Threaded Fastener Driving

Chicago Pneumatic has maintained industry leadership in the development of Torque Control Tools since the first "one-shot" screwdriver was announced in 1954.

If you drive threaded fasteners, there's a CP Screwdriver, Nutrunner, Multi-Runner or Impact Wrench to meet your production line problems.

Fast, accurate driving can save you as much as 75% in time . . . hold rejects to a minimum. Shown here are some of the latest CP tools for threaded fastener driving . . . *industry's most productive line*. Let our Torque Control Specialists help solve your fastener driving problems. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*



TORQUE ANALYZER FOR "ONE-SHOT" TOOLS

provides a fast and simple method for testing and calibrating torque control tools. For fasteners as large as $\frac{3}{8}$ ". Maximum capacity: 200 inch-pounds.

OF SCREWDRIVERS AND NUTRUNNERS

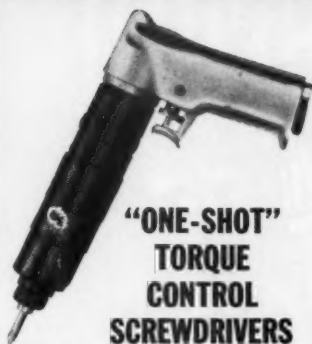
NEW DIAL TORK NUTRUNNER

adjustable at the bench to meet a variety of torque specifications on the same job. So accurate it eliminates final tightening with a hand torque wrench. Capacity: #12 to $\frac{3}{16}$ " machine screws. Adjustable from 50 to 180 inch-pounds.



MICROMETER TYPE TORQUE SELECTOR

lets operator "dial-in" the torque he needs for each size of fastener.



"ONE-SHOT" TORQUE CONTROL SCREWDRIVERS

feature the famous CP "one-shot" clutch and silent exhaust. Capacity: #4 to $\frac{1}{4}$ " machine screws. Adjustable from 7 to 100 inch-pounds.



"JOLT-FREE" TORQUE CONTROL

ANGLE NUTRUNNERS

Great time-savers for hard-to-reach jobs. Range of torque adjustment: 6 to 70 foot-pounds.

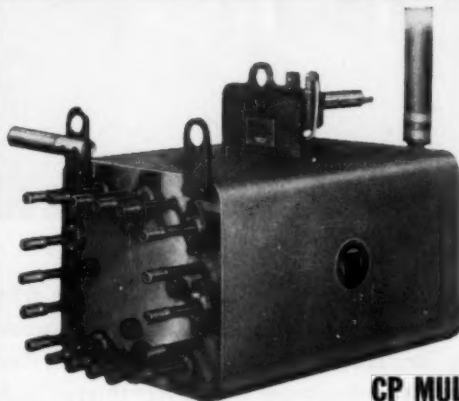


TORQUE CONTROL IMPACT WRENCHES

Recommended where torque limits are critical. Sensing mechanism cuts-off tool air supply the instant specified torque is reached. Capacity to $1\frac{1}{8}$ " bolt size. Range of torque adjustment: 12 to 1000 foot-pounds.

NEW CP-606 IMPACT WRENCH

...a real powerhouse. Gives fast rundowns...loosens frozen nuts or bolts fast. Capacity: $\frac{3}{4}$ " square drive; $\frac{3}{4}$ " bolt size.



CP MULTI-RUNNERS

drive every fastener "just right." Husky motors and "one-shot" clutches insure proper tightness, eliminate work spoilage.



NEW CP-6020 IMPACT WRENCH

Hand-sized, but a man-sized performer, this $\frac{1}{4}$ " bolt size capacity tool packs a fist full of power. 8 models with lever or offset handle. $\frac{3}{8}$ " square drive, or 3 sizes of hex slip chucks: $\frac{1}{4}$ ", $\frac{5}{16}$ " and $\frac{3}{8}$ ".



Chicago Pneumatic

8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • ELECTRIC TOOLS • AIR COMPRESSORS • DIESEL ENGINES • HYDRAULIC TOOLS • AVIATION ACCESSORIES



10426-CH

How critical can you be in your selection of a fastener for a special application . . . especially when extreme accuracy, reliability and consistent performance are specifications. For over thirty years, Chandler has been producing special fasteners and standard cap screws and bolts that meet these demanding requirements.

If you have a special fastener problem . . . here's what you can expect from Chandler. *Into the design* of your special fastener goes the knowledge of expert Chandler engineers . . . careful attention to detail and exhaustive testing to meet critical standards . . . advanced production methods to assure on-time delivery . . . **RESULT** . . . a precise fastener, custom-tailored and mass-produced at the most favorable cost.

Next time . . . Check with Chandler . . . **FIRST.**

Write today for your Chandler catalog.



chandler Products Corporation

1543 Chardon Road • Cleveland 17, Ohio

Use postpaid card, Circle No. 223

Ideas and Reports, continued

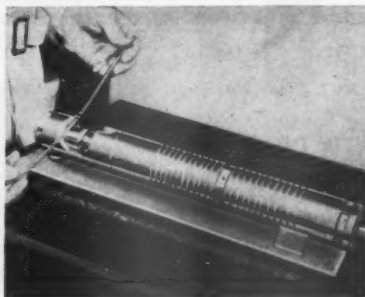
condition despite unfavorable soil and moisture conditions was a problem facing the Columbia Water System of Columbia, Tenn., two years ago.

At that time a new sealing method was tried, experimentally. Based on the two year performance, the method has now become a standard procedure.

To keep the underground meters free of seepage and silt, an aluminum-filled epoxy cement was used. The cement, Metalset A4, made by Smooth-On Manufacturing Co., was applied around the outside edge of each meter glass to a depth of approximately 1/32". Moderate heat was applied to each bond for between 30 to 45 minutes.

After two years, the seals are still leaktight. In addition to eliminating the problem of seepage, the Columbia Water System has found that the epoxy bonding costs about 50% less than earlier techniques used.

PORTABLE SWAGING MACHINE REPAIRS AIRCRAFT CABLES



A portable swaging machine made by Aircraft Tools, Inc. employs a mechanical process that cold flows the metal of a terminal into the interstices of the strands of cable to which it is attached. As a result, aircraft control cable repair jobs are being pushed out of the traditional technical status at considerable savings in time and money. The machine performs so accurately its operator needs no formal training.

The unit operates on 90 lbs air pressure. It produces terminal grips which are in excess of the maximum strength of the cable to conform to military specification Mil-T-6117.

PQA* proves it



This Allen screw passes
multi-million-cycle test
under high load conditions

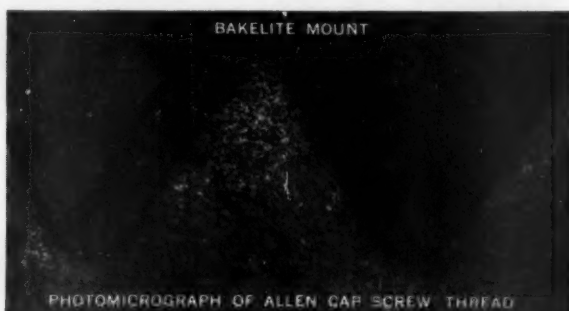


BAKELITE MOUNT

PHOTOMICROGRAPH OF COMPETITIVE CAP SCREW THREAD

50X Magnification—unretouched

Here you see a competitive socket-head cap screw where thread laps and deep decarburization (lighter area running through roots of threads) caused premature failure of the screw. When used under high load conditions in an outboard crankshaft-connecting rod-piston assembly, such a screw failure would cause great motor damage.



BAKELITE MOUNT

PHOTOMICROGRAPH OF ALLEN CAP SCREW THREAD

50X Magnification—unretouched

Now look at this Allen Socket Cap Screw. Photo was taken during regular quality control test and shows no thread lap or decarburization. Allen is producing to and inspecting in accordance with MIL-B-7838A for thread discontinuities—your assurance of quality!

*PRODUCT QUALITY ASSURANCE

PQA is the symbol of unquestioned quality at Allen. It stands for *constant* quality control from rigid upgrading of incoming raw materials to shipment of finished products—*plus* an unconditional guarantee that backs up every order!

Quality checks like the one illustrated confirm PQA every step of the way through Allen's manufacturing process. Remember . . . it costs no more to have *genuine* Allens right from stock, and they are only a minor fraction of your assembly costs.



Genuine ALLEN products are available only through your ALLEN Distributor. He maintains complete stocks close by to help cut your freight costs, inventory, warehousing and handling. He offers fast, single-source service. He knows ALLEN products. And he makes ALLEN Engineering Service available to you any time. Call him!

ALLEN
MANUFACTURING COMPANY
HARTFORD 1, CONNECTICUT, U.S.A.



Plant at Bloomfield, Connecticut • Warehouses in Chicago, Cleveland and Los Angeles

Use postpaid card. Circle No. 224



Now! Powasert Feeder makes portable automatic nailing more reliable than ever

Nails fed to driver by improved high-speed, free-flow raceway. Includes many reliability features developed from over 2,000 units now in the field. No spilling or flipping. Positive driving action at all times. Powasert Portable Nailing Machines now saving companies hundreds of dollars by driving low-cost bulk nails with remarkable speed and efficiency. Up to 120 per minute, greater holding power, more accuracy, greater safety. Available for nail sizes from $\frac{1}{2}$ " to 4". Let Powasert pay off for you, too. Send for details: Powasert Department, United Shoe Machinery Corporation, 140 Federal Street, Boston 7, Massachusetts.

United **POWASERT**®

*The Automatic Way
to Fastener Speed
and Savings*



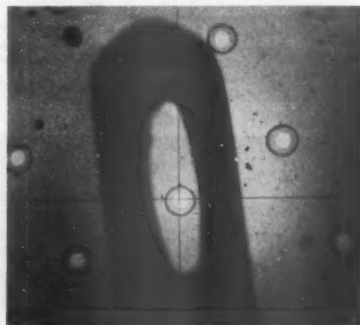
Use postpaid card. Circle No. 225

Ideas and Field Reports, continued

The dies in the swaging machine are made from Allegheny Ludlum Steel Corp. Sagamore tool steel. The yoke which holds the dies is also made from the tool steel.

HIGH RELIABILITY IN GLASS SEALED ELECTRONIC PARTS

A high volume method for sealing, using a film of glass over a thousand times thinner than a window pane, was reported by the Components Division of IBM to give high reliability in microminiature diodes and transistors. The development holds promise of overcoming many cost and reliability problems inherent in producing microminiature devices.

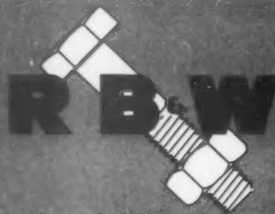


Glass film technique is shown in greatly magnified portion of small silicon wafer. One of the diodes can be seen framed in the eye of a small sewing needle. The glass film is .0001" thick.

Sealing against moisture and other atmospheric contaminants is essential because of the critical role played by the sensitive surface of a transistor or diode in determining the device's performance.

The method begins with the conventional fabrication of diodes or transistors on silicon wafers, followed by an oxide coating process for initial protection. Then, rather than plastic encapsulation, or hermetic sealing in metal containers, a special glass powder is applied to the oxidized surface. The entire wafer is fired at more than 1500°F. The result is a microscopically thin film of chemically resistant glass with a smooth, pinhole-free surface.

The wafer is then cut with an ultrasonic "knife" into the tiny diodes or transistors, each retaining its permanent glass seal. Electrical contact is made through small holes etched through the glass and oxide.



FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



Technicalities

by Fred E. Graves

Nuts have performance 'designed in'

A standard nut isn't as simple as it looks. Much design know-how goes into its manufacture. Proper design avoids these pitfalls.

1. Thread shear: Several factors cause this. The nut may not be high enough to contain sufficient threads; its material may lack plasticity that enables it to deform under tightening so that enough threads engage and distribute the load to avoid progressive shear.

2. Wall dilation: The inclined-plane effect of the thread's helix angle resolves torque on a nut into two components: vertical (shear) and horizontal (dilation). Dilation enlarges nut's diameter, shifting the load towards weaker tips of threads.

3. Crushing: Nuts that aren't wide enough across the flats bear down on too small a surface. High unit stress may crush the bearing surface, with relaxation of bolt tension the undesirable end result.

Reputable fastener manufacturers provide you with ASA "Finished" nuts having enough height to sustain high thread tension, sufficient wall thickness to control nut dilation under load, and the right amount of bearing area. Nuts manufactured for ASA's "Heavy" series are higher and 1/8-inch wider across flats for added bearing area and wall thickness. They are generally used with high strength bolts or when bolt holes have large clearances.



Sintered nuts are so strong bolts fail before they do!

IN A brute force test of strength, sintered stainless-steel nuts and cold-headed standard hex screws were assembled and pulled apart in a tensile tester to determine what would fail first.

Results you see pictured above—1/2 inch hex bolts, stretched to failure. But their sintered nuts show no damage, either to internal threads or wall.

QUALITY GOVERNS STRENGTH

What gives sintered products their strength? At RB&W it's strict attention to purity of raw metal powders plus carefully-controlled mixing,

compacting, and sintering. Also special heat treatments.

The table shows typical proof loads achieved by RB&W sintered nuts. They're more than ample for the bolts. Full size range available.

OTHER PHYSICAL ADVANTAGES

These nuts have excellent surface finish. Holes are perfectly round; threads are thus precisely tapped.

Perfectly dimensioned, corners filled out, chamfers uniform—each sintered nut is an exact reproduction of the other.

The same quality workmanship and facilities which fashion RB&W's stainless steel and brass sintered nuts are also at your service for sintering special parts. Write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

Size	Material	Proof Load (lbs.)
1/4-20	*Brass	2060
1/4-20	**18-8 Stainless Steel	3800
3/8-16	*Brass	5000
3/8-16	**18-8 Stainless Steel	9300
1/2-13	*Brass	9200
1/2-13	**18-8 Stainless Steel	17050

*Equivalent to screw stress of 65,000 psi

**Equivalent to screw stress of 120,000 psi

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Sales office and warehouse at: San Francisco, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago.



An Automotive Look at

by **James R. Love**, Engineer
Body Stress & Weight Analysis
Engineering Division
Chrysler Corporation
Detroit, Michigan

Automotive design and assembly considerations for adhesive bonding are covered in this first of two articles. Three phases in the transition to wider usage in automobiles will be covered next month.

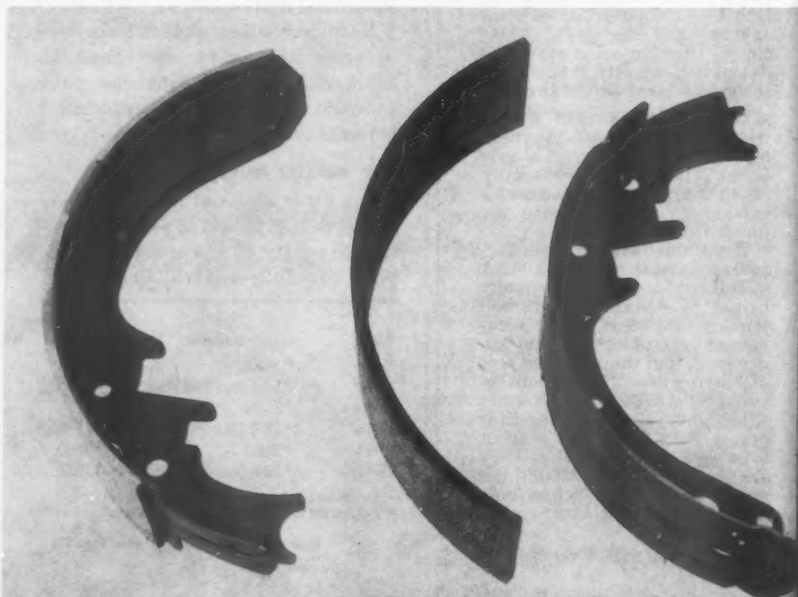
PART I

During the past few years, considerable attention has been focused on structural adhesives and their future as a fastening technique in the automotive industry. Many papers have been presented at ASBE, ASME, SPE and SAE technical sessions, and trade journals have contained numerous articles on this subject. The majority of these have noted the amazing technological advances of the adhesives industry since World War II.

Examples of the impact of the new structural adhesives on other industries have been mentioned, particularly those for bonding metal to both metallic and non-metallic materials. Convair's B-58 bomber, which holds the trans-Atlantic speed record, has been cited as a spectacular example of how structural adhesives are applied in the aircraft industry. Bonded sandwich panels on the wing and tail surfaces, and

FIGURE 1

Bonded brake shoes were an early application of adhesives in the automotive industry. Chrysler has been using bonded brake linings since 1948.



at Structural Adhesives

beaded panels in the fuselage, make up an estimated 95% of the aircraft's surface; the total adhesive weight is over 1000 pounds.

Applications in other industries have received considerable attention. Light-weight, high-strength, bonded honeycomb panels have been utilized in such diverse applications as trailer bodies, military hangars and barracks, furniture, prefabricated homes, farm buildings, stores, motels, pallets, etc.

Existing automotive applications have also received comment. Chrysler, for instance, has been using bonded brake linings (Figure 1) continuously since 1948. In a recent SAE paper, E. J. Sydor, chief engineer of our Cycleweld division, indicated that over 100 million shoes had been bonded without a single

major brake failure attributable to the bonding process.

Contributions of structural adhesives to the nation's missile and space programs have not gone unnoticed. In another SAE paper, S. J. Dastin, of Republic Aviation, reported that a new "composite adhesive" has been developed for bonding solid fuel rocket motor cases. This adhesive permits wall stresses in excess of 250,000 psi.

These illustrations serve to show that adhesives have the ability to form high-strength metal bonds in commercial applications. However, this alone is not enough to suggest that particular structural adhesives should be used in automotive body structures. What then are the advantages that adhesive bonding offers to the body structural engineer?

There are several reasons why we should consider adhesive bonding along with the more conven-

tional methods of fastening such as welding, brazing, bolting, riveting, and soldering. These reasons include the following:

- A properly designed bonded joint distributes the stress over the entire area of the joint, permitting the use of lighter gauge material in many cases.

- Dissimilar materials such as glass and metal or plastic and metal, which are difficult or impossible to join by ordinary methods, may be bonded together.

- In the case of dissimilar metals, the adhesive bond provides a non-conductive insulator between the two materials, eliminating the possibility of electrolytic corrosion.

- Bonding allows structural members and reinforcements to be attached directly to exposed panels.

- An adhesive bonded joint has unmarred appearance.

continued

FIGURE 2

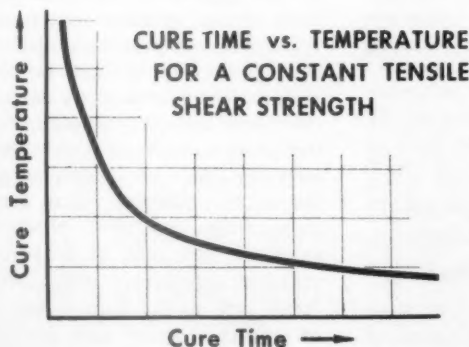
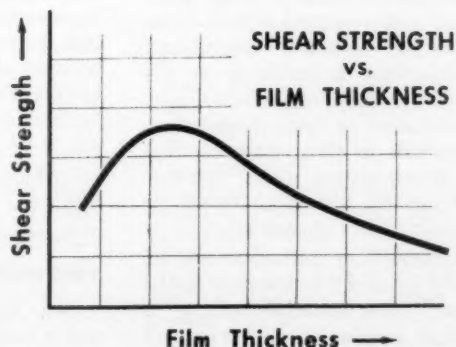


FIGURE 3



- Bonding provides a continuous contact between mating surfaces, creating a seal as well as a structural tie.

- The film of certain adhesive materials provides a measure of vibration damping between the adherends, increasing fatigue life and lowering sound levels.

From this list of potential advantages, one might conclude that adhesives are a possible panacea for our fastening problems. If this is the case, why then hasn't there been a significant breakthrough of structural applications in the automobile body. The answer to this question will become evident as we proceed with this discussion.

MATERIALS AND PROCESSES

Let's take a brief look at some of these materials and bonding

setting. The application of heat or the use of a catalyst (or both) may be used to initiate this reaction. Further discussion will be limited to the more common thermosetting materials considered for metal-to-metal structural bonds, namely the synthetic rubber-phenolics and modified epoxies.

These materials are commercially available in a variety of forms, including liquid, paste, powder, and dry film. Synthetic rubber-phenolics are one-component heat-curing materials most commonly used in film or paste form. Modified epoxies are most frequently used as one-component heat-curing films and pastes or as two-component, room-temperature-curing pastes.

A discussion of the structural capabilities of these materials can get quite complicated. A given adhesive

surface preparation, adhesive application, and bond development or curing.

The ultimate strength of the bond is directly related to the care exercised in cleaning the adherend surfaces. Drawing compounds, paint, rust or other oxide film, oil, or dust must be removed so that the adhesive may "wet" the surfaces. Normal cleaning systems include chemical cleaning, sand blasting or abrading, and vapor degreasing or solvent wiping.

Adhesives have been developed which will dissolve and absorb certain surface impurities. However, these materials are costly and have been only partially effective, resulting in lower bond strength. Certainly, this is an area where additional work must be done before adhesives can achieve a prominent

FOUR BASIC TYPES OF STRESS

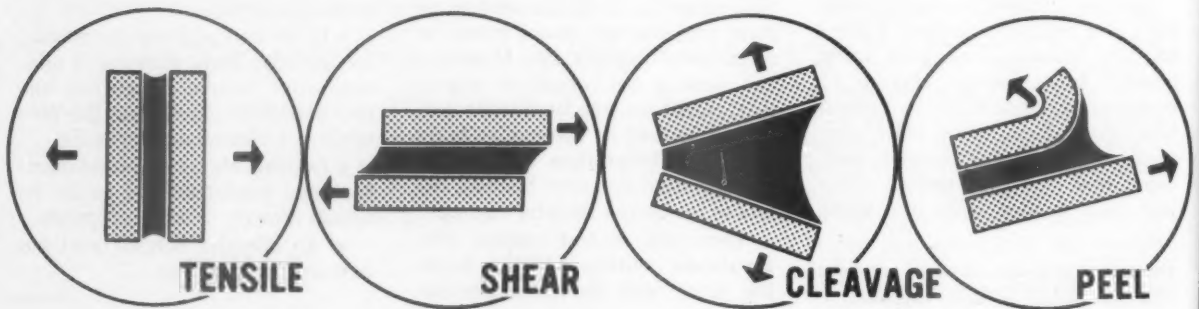


FIGURE 4

processes. First of all, what is meant specifically by the term "structural adhesive"? To me the simplest and most logical definition is merely, "an adhesive which bonds together two load-bearing members." These members are referred to as adherends.

One system used to bring order to the rather complex and large number of adhesive compounds classifies them according to the nature of the basic and predominant material used in their formulation. This results in three major groupings: thermosetting resins, thermoplastic resins, and those based on synthetic rubber elastomers.

Thermosetting adhesives are of primary interest for structural applications. These materials undergo a chemical reaction in the process of

will normally be an "alloy" created to achieve a desired combination of physical properties to meet specific end-service requirements. Also, environmental conditions of moisture exposure and temperature, cleanliness of adherend surfaces, cure time and temperature, film thickness, adherent dimensions, residual stress within the joint, and joint design itself, influence the ultimate strength of the bond. However, assuming proper control of the above factors, tensile shear strengths on the order of 2000 to 3000 psi may be achieved with materials which fulfill the end-service requirements of automobile body application.

THE BONDING PROCESS

Now let's look at the three steps which make up the bonding process:

place in the automobile body structure. Surface preparation is costly and time-consuming.

Adhesive application may be accomplished by spray, flow gun, brush, roller, or (in the case of adhesive films) by "tacking." The desired rate of assembly and nature of the application will dictate the form of the adhesive and type of application equipment required. Resolving the application problems with the automobile body assembly rates will tax the ingenuity of the tool process engineers. For example, adhesive tapes are widely used in the aircraft industry where careful hand work and slow production rates are the rule. It is hard to visualize equipment which would apply tape to the hem flange area of a hood assembly with a produc-

tion rate of about 350 units an hour.

Bond development or curing involves initiation and completion of the chemical reaction required for thermosetting materials. Heat, pressure, and time are the important factors in this step. A temperature of 350°F and a pressure of 200 psi must be maintained for 25 minutes to cure a typical synthetic rubber-phenolic adhesive.

Modified epoxy adhesives do not require pressure beyond that needed to properly position the adherends during cure. A typical one-component modified epoxy would cure in 30 minutes at 350°F. Two-component, room-temperature epoxies may require as long as seven days to achieve complete cure. However, this time can be shortened by the application of heat. These room-temperature materials appear quite

sure 2 shows a characteristic time-temperature plot. Actually, a whole family of curves exists with each curve indicating a constant bond strength. Similar work has been done with reduced times under pressure.

The necessity for a controlled cure cycle presents a major obstacle to increased use of adhesive bonding in body structures. Certainly the paint oven cycle closely approximates the normal adhesive cure cycle. However, the problem of retaining the relationship of the parts being bonded prior to cure still remains.

Some of the factors which affect the ultimate strength of the bond mentioned earlier deserve additional comment at this time. Figure 3, for example, indicates the relationship of cement line thickness to shear

sible under load and to minimize peel and cleavage stresses. Stress concentrations caused by unequal loading should be minimized. Merely applying adhesives to joints designed for spot welding or mechanical fastening may give unsatisfactory results.

Figure 5 shows the effect of temperatures on shear strength. Operating environment conditions (often of little concern with other fastening techniques) must be carefully considered when using adhesives.

We have considered some of the factors which affect the ultimate strength of structural bonds. Obviously, the full adhesive potential does not need to be realized in each application. Economical use of adhesive bonding demands a careful analysis of the strength requirements of each joint.

The usage of adhesives requires adequate non-destructive testing methods. The very close quality control exercised in the aircraft industry does not appear to be compatible with the high production rates in the automotive industry.

From this discussion, it is apparent that there are many factors to be considered in the extended use of bonding automotive body structures. There is no doubt that structural adhesives have a definite place in body structures, and will gradually achieve increasing prominence as a fastening technique during the next decade.

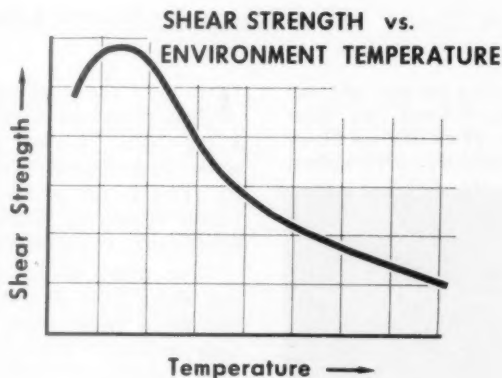


FIGURE 5

attractive. Their ability to achieve some strength prior to heat application would appear to make them suitable for some stamping plant sub-assemblies where ovens are not available. It must be remembered, however, that cure starts immediately after mixing; pot life is short. Automated assembly would demand mixing nozzles incorporating a flushing system to prevent curing of the material within the nozzles during down-time. Such equipment is available but may be difficult to adapt to high-production rates.

The cure cycle time-temperature-pressure relationship has been the subject of much laboratory investigation. Using higher than normal temperatures for shorter periods of time ("hot shot" curing) has received considerable attention. Fig-

ure 2 shows a characteristic time-temperature plot. Actually, a whole family of curves exists with each curve indicating a constant bond strength. Similar work has been done with reduced times under pressure.

JOINT DESIGN

Proper joint design greatly affects ultimate bond strength. Figure 4 shows typical stresses applied to adhesive joints. These joints are normally strong in tension and shear but weak in peel and cleavage. Usually, more than one type of stress will be imposed on a given joint. The joint should be designed to place as much adhesive area as pos-

REFERENCES

- Bergler, W. H., Jr., and Associates, "Structural Adhesives—An Introduction for Potential Users," Structural Adhesives Associates, 1958.
- Hess, E. F., "Structural Adhesives for Joining Metals," *Assembly & Fastener Engineering*, March 1960.
- Thomson, A. F., and Martin, A. F., "Structural Adhesives in Automobiles," Paper presented at SAE National Automobile Week, March 1960.
- Poston, I. E., Downing, K. D., and Mack, K. J., "The Glue Line—Why, How and When," Paper presented at SAE National Automobile Week, March 1961.
- Sydor, E. J., "Bonding of Structural Adhesives," Paper presented at SAE National Automobile Week, March 1961.
- "Automatically Stuck," *Automation*, March 1961.
- Dastin, S. J., and Rosenberg, P., "Adhesive Bonded Rocket Cases," *SAE Journal*, June 1961.
- Charter, K. F., and Butzlaff, H. R., "Factors in Joint Design for Adhesive Bonding," *Assembly & Fastener Engineering*, July 1961.

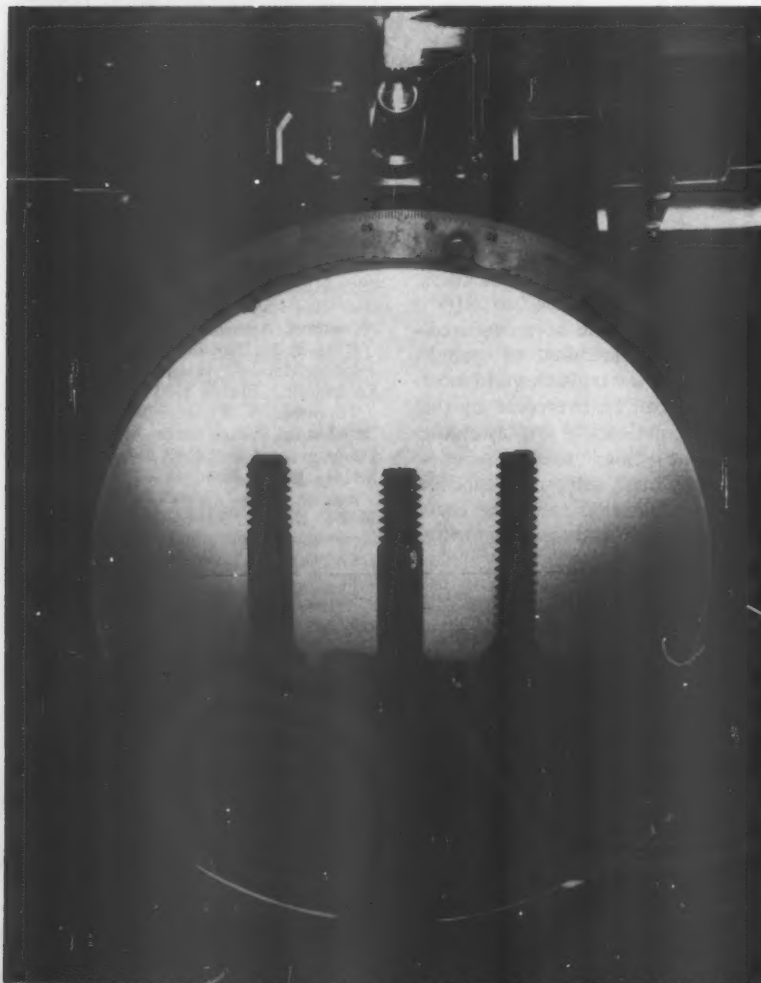


Threaded fasteners of this size (00) are used in the millions by the electronic, optical and instrument industries.

Yankee ingenuity vs. imports

by Matt E. Heuertz, Editor

Here are double-ought fasteners greatly magnified. The one on the right was roll-threaded with special tooling developed at Harvey Hubbell. The other fasteners are imported products made on screw machines which turn out 26-30 screws a minute compared to around 150 a minute on Hubbell's roll-threaders.

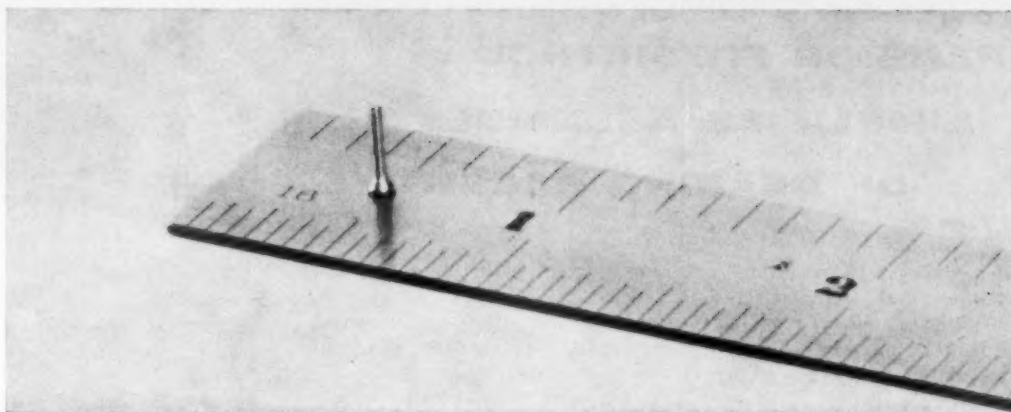


To meet the challenge of overseas producers with their much lower costs, you've got to use some old-fashioned Yankee ingenuity. This is the philosophy of the people at Harvey Hubbell, Inc., of Bridgeport, Connecticut.

"Too many of our counterparts just shrug their shoulders and say that it's a losing game to compete with imports," points out W. C. "Bill" McClane, sales manager of Hubbell's machine screw department. "Their worst enemy is their own apathy. They simply have forgotten that engineering ingenuity built the foundation of their own companies."

You can realize the truth of these words, and especially the philosophy behind them, when you consider that the market for Hubbell's products is one which is especially attractive to competitors abroad. Regarding this competition, the people at Hubbell believe that it all depends upon what each individual company cares to do about it. While the management of one company may just sit back and do nothing but lament about their business slipping away, another like Hubbell will tackle the job with determination to beat overseas competitors at their own game.

"Actually," McClane emphasizes, "we have a healthy appreciation for



Hubbell roll-threads this size screw five times faster than they can be made on screw machines.

Whether you make end-products or component parts and your market seems vulnerable to imports, you can beat this low-cost competition with old-fashioned ingenuity which ignores the "can't be done" attitude of lethargic people.

this competition from abroad. It's stimulating. It challenges us to out-produce them, both cost-wise and quality-wise."

And this is exactly what Hubbell is doing—and on double-ought (00) fasteners at that.

Getting into the 00 screw business was a natural for the company. Aware of the fast-developing trend toward miniaturization, back in 1953 Hubbell started making single-ought (0) screws. They were so successful in this venture that the standards they set up have been incorporated into the A.S.A. standards for 0 screws.

Then, with the advent of sub-miniaturization, it was only logical for them to look at the market for 00 fasteners which are used in the millions by the electronic, optical and instrument industries. Fasteners of this size were being made primarily on screw machines at the rate of 26-30 per minute. This low rate made 00 fasteners a natural item for overseas producers with their much lower overhead.

Imported screws of this size sell for about \$3.00 per M, and to beat this price, the Hubbell people knew that they had to not only mass-produce the 00 screws, but also come up with much higher quality. This meant high-speed roll-

threading. But could you make such fasteners at the rate necessary to offset the much lower overhead of overseas producers, and still come within the 3½% minimal AQL of the industry?

The people at Hubbell will be the first to admit that they had absolutely no know-how up to this time in roll-threading sub-miniature fasteners. But they tackled the job anyhow.

It took some brainwork before Bill McClane and Frank Matula, department superintendent, came up with the right answers. In the process they threw out some old thinking regarding the cold working of metals. But within seven months after they found the key, they had a whole battery of machines retooled for 00 screws. While they spent about \$30,000 getting the first machine tooled for the job, 17 additional machines were converted at a total cost of less than \$20,000.

Net result: About a year after Hubbell decided to get into the 00 fastener market, they got their first order late in October. It was for a million 00-90 screws made from chrome nickel stainless steel. They beat the importer's price by about 10% and the quality of the screws is well within the 3½% minimal AQL.

Of course, the secret is in the tooling which permits Hubbell to roll-thread 00 fasteners at the rate of 150 per minute, compared to the 26-30 per minute rate of screw machines.

McClane muses that it will be several years before their overseas competitors can catch up with them. "By that time," he predicts, "we'll be turning these miniature fasteners out at 250 a minute or faster."

There is one additional factor which should not be overlooked in the success of Harvey Hubbell, Inc. It is the spirit of their employees who are an integral part of their competitive team. They are as anxious as management to turn out quality work. This teamwork has resulted in their employees enjoying a significantly higher wage scale than that prevailing in the community. In addition, all employees participate in a production bonus.

Such wages are paradoxical in an industry which generally blames the influx of fastener imports on the lower labor costs overseas. "Actually," surmises McClane, "many companies in this country have much more engineering know-how than we have, but they simply aren't using it. If the imports are hurting them, it's mostly because of their own lethargy."

EXPANSION FIT METHOD SIMPLIFIES ASSEMBLY OF BEARING RACEWAYS

For component parts requiring a tight, uniform fit, the expansion-fit technique is relatively simple but highly effective. It is especially applicable in the assembly of machine tool parts.

The basic principle is dependent upon the dimensional change that occurs in metals with temperature change. With this technique, the smaller part is chilled, with the ultimate temperature depending upon the type of metal used and the amount of shrinkage required.

Upon warming up to ambient, the chilled part expands within the larger part to form a tight fit. The parts may be machined to within 0.00005 or closer, and assembly is accomplished without the use of force.

This expansion-fit technique is employed at the R. K. LeBlond Machine Tool Co., Cincinnati, in the assembly of bearing raceways on their line of Regal lathes.

Lathes must be designed to withstand many destructive forces. The headstock especially is subject to great stresses. Basically, these forces

may be resolved in three principal components: vertical, tending to bend the headstock up; crosswise horizontal, causing the head to swing out of line; longitudinal, forcing the head and tailstock apart.

To withstand these thrust and radial forces—which may be well over half a ton—all gear and pinion suspensions must be accurately and firmly positioned. LeBlond accomplishes this by means of a three-bearing spindle.

The spindle is supported at three positions by two precision roller bearings at front and center, and by a ball bearing at the rear. Accurate and positive positioning of work holding devices, as well as heavy cutting ability, is dependent to a great extent upon the front roller bearing. The seating of this bearing race is an operation requiring care and precision. It must be seated into the machine casting in such a manner that it maintains its original size and shape, and be free of mars or deformations of any kind.

Considerably more pressure would be required in the use of the

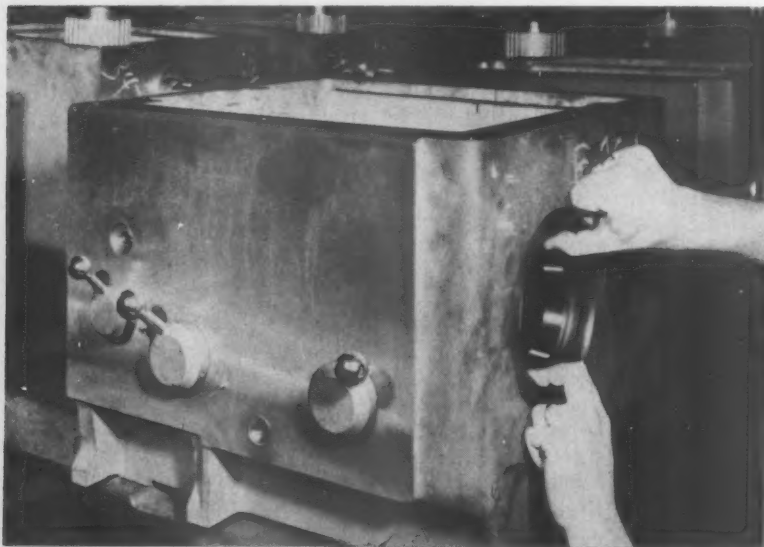


Bearing raceways are chilled in low temperature chamber to about -60°F .

press-fit technique than could be tolerated by either part. Also, shrink-fitting would have required a greater length of time for heating the heavy casting to approximately 600°F ., than would be involved in chilling the raceway. Therefore, the expansion-fit technique—involving chilling the smaller part—was selected.

In the expansion-fit technique, the bearing race is first chilled to about -60°F . in a Cincinnati Sub-Zero Products industrial chamber. Due to the high Btu/hr rating of this unit, and because the races are light in weight, the pull-down is accomplished in a relatively short time. A large quantity of races is chilled simultaneously. Since the chilling in no way damages the metal, regardless of how long it is left in the freezer, a sufficient amount of raceways for assembly needs is always in readiness.

Assembly is simple and requires no special skill. The races are removed from the freezer by a worker wearing gloves. They are then seated into the headstock, and held firmly for a few seconds. No tools are required for this operation. If there should be some delay in the seating, the bearing race is returned to the freezer and will be ready for use again in a matter of minutes. ●



Chilled part is seated by hand in lathe headstock, and held firmly in place for a few seconds. Next production operation can be done immediately.



Assembly Control

Through Automatic Data Processing

by **Robert W. Parker**, Head
Industrial Dynamics Systems
Hughes Aircraft Company
El Segundo, California

Part 2

Application of data processing to assembly work at Hughes, plus the reporting system used to maintain continuous control, are covered in this article.

Last month in Part I, we summarized a description of the automatic data processing setup used at our El Segundo division to control all facets of production, then went into somewhat more detailed explanation of the use of data processing in assembly control. This part of the article will cover the use of automatic data processing for control of actual assembly operations, for control of finished goods, and for control of labor.

It is unnecessary to describe and illustrate all the documents used in these controls and resulting therefrom. But all documents have a common end purpose—to keep the

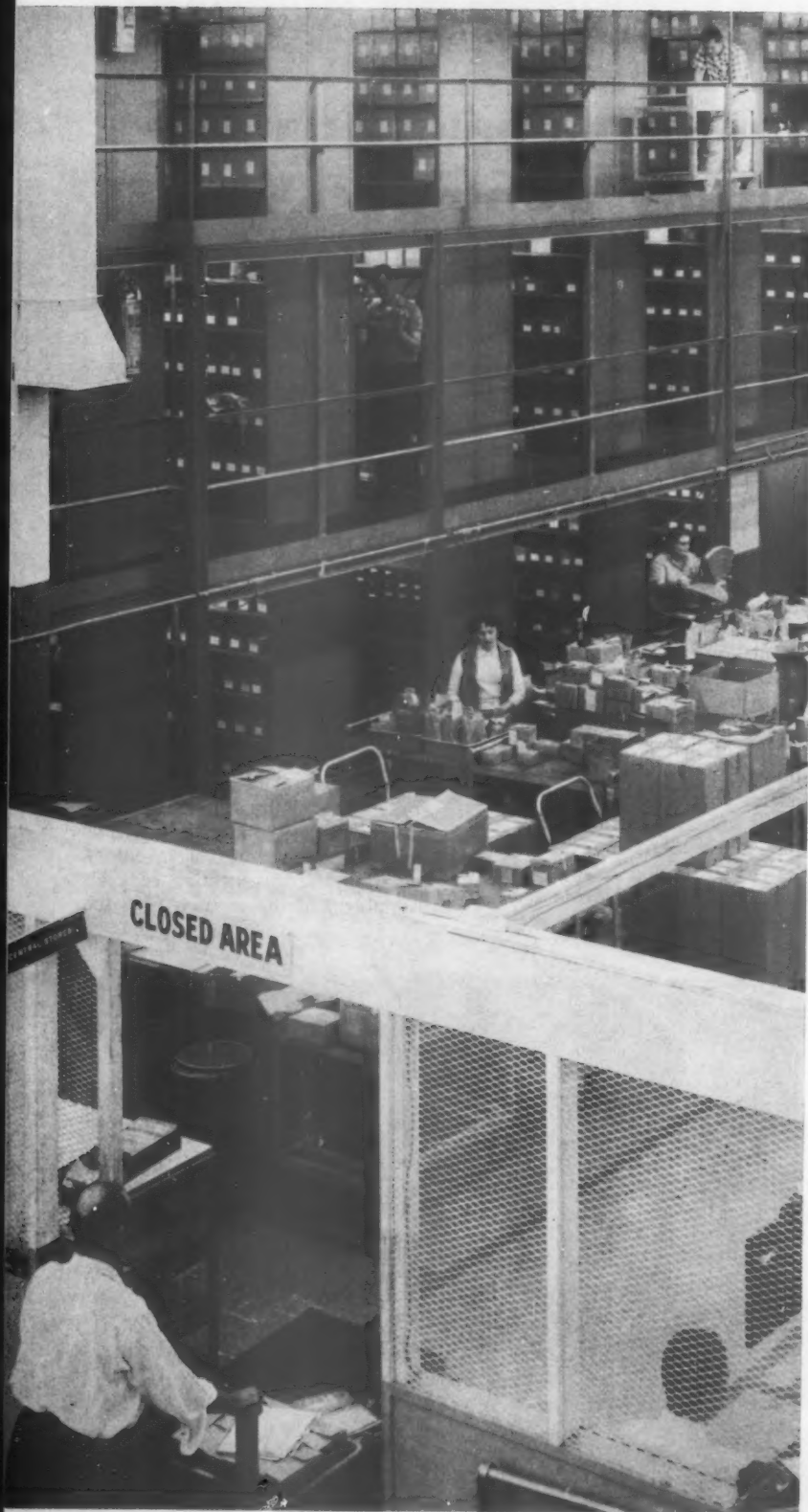
information stored in RAMAC continually updated so that the reports issued from RAMAC information will be current and usable. Many of these detail documents might have to be modified if the same data processing system were installed in another plant.

In general, the information stored in RAMAC is modified by a document everytime an assembly is moved, everytime work is performed upon it, when it is affected by engineering changes, when it must be expedited, when assembly order quantities are modified, if rescheduled, when serial numbers must be revised, etc. The result of this continual updating of information provides reports that reflect current inventory status, current inventory requirements, the location of each assembly and the amount of work

continued

An assembly worker clocks in at a Transactor unit. Thirty-two of these units, distributed throughout the assembly and storage areas, furnish information to the computer department.





that has been performed upon it, the amount of work completed in relation to schedule requirements, etc., etc. In fact, any control information required is immediately available, and such information is current, not history.

CONTROL DURING ASSEMBLY

Assembly orders are grouped in the following two general categories:

(1) **Shippable Assemblies**—This is an order for parts that have been contracted for and will be shipped upon completion of the order. Strict control is maintained over these orders, and when production and quality control functions are completed, these assemblies are closed to Finished Goods Stores.

(2) **Non-Shippable Assemblies**—Sub-assemblies which are components of shippable assemblies are built on a "Non-Shippable" order. Control of these orders is on a lot basis. These orders will not close to Finished Goods Stores but will close directly out of "Quality Control" to their using assembly.

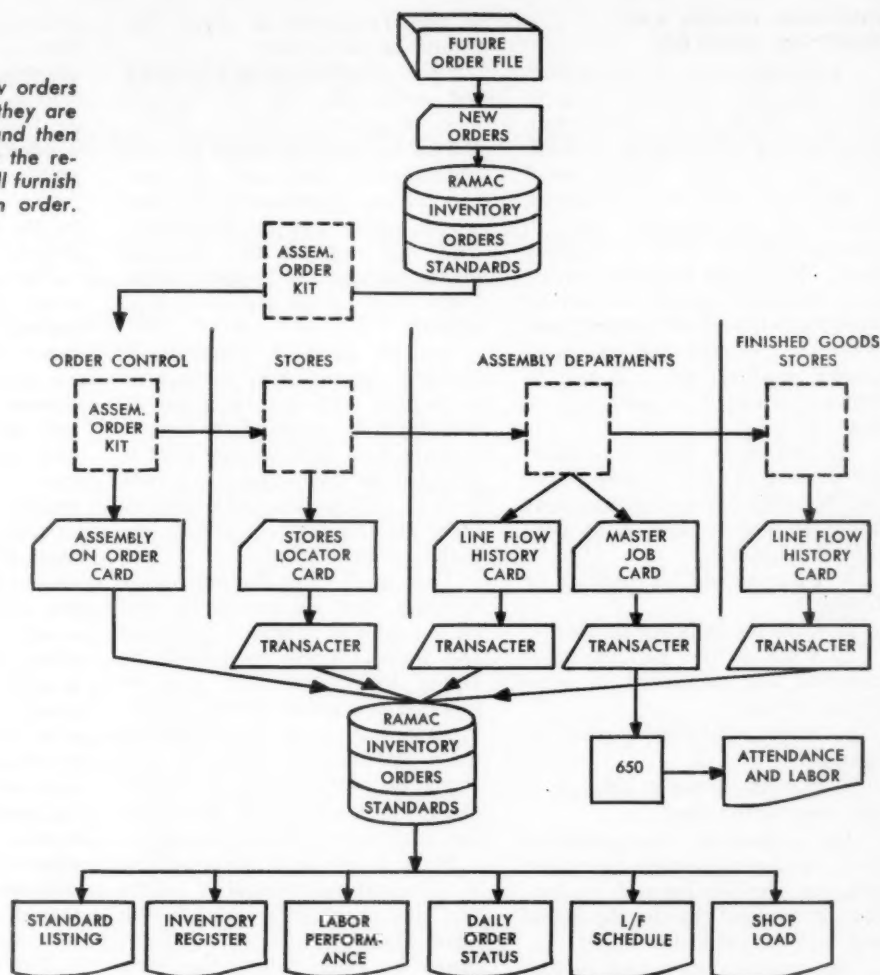
The period of time between the initiation of an assembly order and its completion may be broken down into six major categories:

1. Origination of order.
2. Release of order from Order Control to Controlled Parts Stores.
3. Release of order from Controlled Parts Stores to Work-in-Progress Stores.
4. Actual assembly on line.
5. Inspection and testing of assembly.
6. Completion of finished product.

Assemblies being built on one order may be in two or more of these major areas at one time, but

Part of the storeroom showing three tiers of inventory parts. By automatic data processing, a complete inventory record on more than 40,000 parts is consistently maintained at the Hughes-El Segundo facility.

This diagram shows how new orders proceed from RAMAC, how they are handled through the plant and then back to RAMAC, as well as the reports or data that RAMAC will furnish concerning the status of an order.



their instant location will be provided by RAMAC.

When a new assembly order is originated, a record providing for these six areas is set up in RAMAC and a packet of pre-punched cards is prepared. These cards accompany the order as it progresses through the plant. They contain data that reference the order and identify the stage of work. As the order progresses these cards are inserted in the Transactor, and variable data (such as the quantity of assemblies completed) is entered on the Transactor dials. This message is then transmitted to RAMAC and recorded on the order record.

MORE ACCURATE COSTS

The reporting of assembly status, standard costs and actual costs are combined within the same system and on the same time basis. This results in more accurate and timely

departmental and product cost statements.

Production personnel in the assembly area record direct labor charges against the assembly order using pre-punched Master Job Cards in the Transactor. Assembly completions are reported by production foremen through the Transactor. By this means the assembly status in RAMAC is updated and standard labor hour credit is awarded to production.

When non-shippable assemblies are completed through post test, Quality Control will make a transaction which will award standard labor credit to inspection and test. In the case of shippable assemblies, a transaction is made via the Transactor when the assembly is received in Finished Goods. The result of this is to award standard labor credit to Inspection and Test and to provide input to the Finished Goods

inventories which are maintained in RAMAC.

All orders which have been completed for more than five days are closed out of RAMAC at the beginning of each week.

As so often happens, the status of an assembly order may change several times during its production. Various input documents for RAMAC are provided which reflect these status changes. By using the proper document, the following revisions may be made to an assembly order already stored in RAMAC: (1) The assembly order may be rescheduled; (2) The assembly Order may be expedited; (3) The Procurement Code, project, make department, or lot of the assembly order may be changed; (4) The assembly order may be reduced, or canceled entirely; (5) A revision of serial numbers covered by the assembly order may be made.

continued

FINISHED GOODS AND SHIPPING CONTROL

Upon completion of production and inspection, assemblies close to Finished Goods Stores after which they may be subjected to Systems Test and Inspection. Defects noted at this point could result in rework either on the assembly line, in Finished Goods, or at a vendor's plant. When such rework is necessary, RAMAC records are altered to include all necessary information. When the assembly conforms to all quality specifications it is sent to Shipping where it is packaged and shipped.

This system is designed to maintain control over the Finished Goods and Shipping inventories through its ability to answer these basic questions on demand:

1. When should the product be finished?
2. What products are finished?
3. What is the current status (location and condition) of completed products?
4. When should the product be shipped?
5. Was the product shipped to the customer on time?

The answers to these questions lie in developing manufacturing and shipping schedules for each product, then comparing this to the actual status of the product.

The control system used in Finished Goods utilizes status and schedule information maintained in RAMAC in the inventory record established for the Assembly Order Control system. The status in RAMAC is maintained through the use of Transacters located in Finished Goods Stores, Compliance, and Shipping Office. Movement of assemblies is recorded by inserting a part identification card along with a Transaction Stub Card into the Transacter.

ATTENDANCE AND LABOR REPORTING

Each employee is responsible for properly recording attendance and labor charges. In clocking in at the start of a shift, the employee inserts his personal identification card into the Transacter and depresses the "transmit" bar. This will record the employee's presence on the job at the time transmitted. After receiving a job assignment, he will select the related job card located

at the Transacter to report the "Start" of the activity.

Upon changing jobs or an activity for any reason, the time worked must be reported. This is accomplished by inserting the personal identification card and the pre-punched card representing the next job or activity into the Transacter. The "Start" time on the subsequent job or activity will be used as the "Stop" time on the previous job or activity.

Rework labor is recorded in RAMAC in the same manner as production with the exception of identifying the cause of the rework performed. A Sub-Account card is provided for this purpose and must be used with the employee and job order identification cards when reporting rework labor.

Time away from the job (union activities, first aid treatments, and other company approved activities) and Indirect Labor performed by Direct Employees must also be reported at the start of the activity. Pre-punched cards representing these activities are provided and should be inserted in the Transacter along with the employee identification card to record such charges.

Elapsed time on a job or activity is calculated automatically from the "In" time punched on each job. The labor charge for one activity automatically stops when the next activity is reported as "starting."

REMARKS AND SUMMARY

In ending this article, the author would like to discount the "aura of mystery" which seems to have been built up around automatic data processing equipment. Continual reference to data processing equipment as machines with "brains," machines with "memories," and machines with the "ability to forecast," is only an assignment of human values to purely electronic and mechanical operations. For every bit of information that comes out of a data processing machine, information must be put into it.

This input information must be coded in a manner so that the machine will detect the code, then use the information to alter, delete, or otherwise change specific information previously put into it. This updates the information on record, and when called upon to do so, the machine can "put out" this

information in one of several forms. Such output information may be in the form of punched cards or tape, recorded on magnetic tape, or in the form of verbal print-outs. How the data processing machine accomplishes this rearrangement and updating of information is a problem for the computer engineer, not the man using the equipment.

The automatic data processing setup in use at the Hughes El Segundo plant is based on these simple principles. Coded documents are provided for nearly every conceivable operation or usage of time and material on a product, along with coded documents for handling many emergency or unexpected happenings that may affect production or cost. The data processing equipment utilizes the information provided by these documents to alter the information previously stored, to add to it, to modify it, maybe to delete it, and sometimes to compare it with other information already stored (such as comparing the products ready for shipment with the products scheduled for shipment at that time). The machine will also accumulate certain of its data in tabular form for the issuance of reports to management and specific control departments, but only when activated by input information which instructs it to do so.

This may be a brash over-simplification of how data processing works, but it illustrates the basic principles.

As to the value of automatic data processing here at Hughes, the advantages can be summed up in some brief but comprehensive statements:

1. Great accuracy and consistency from the use of common input data and machine processing has been obtained.

2. More effective management control reports are available much faster and in a more updated form than when manual efforts were employed.

3. There has been a sharp reduction of clerical effort through elimination of routine information handling functions.

4. Costs have been minimized by application of control techniques made possible by computers.

5. Rapid processing of engineering changes and schedule revisions permits accelerated procurement and production action.

Aerospace industry

sparks revolution in fasteners



The status of current lightweight threaded fasteners is reviewed to place emphasis on the utilities of miniaturization, structural weight reduction, installation ease, and high temperature adaptability.

by **James B. Duke**, Manager
New Aircraft Product Development
Elastic Stop Nut Corporation of America

For many years weight reduction programs and the aircraft industry have been virtually synonymous. And because they are a vital weight factor in airplane construction, fasteners have constantly been in the front lines of the battle to slice off surplus pounds. Speaking only for the self-locking nut section of the fastener industry, the past decade witnessed a major evolution in fastener design and technology. As is so often the case, the pressures generated by the vital requirements of one industry have also resulted in advances that provided extra performance values and solid

economic benefits to many others.

For example, as recently as four years ago the leading manufacturers were introducing newly miniaturized lines of sheet metal self-locking nuts. These parts offered improved high temperature performance and significant weight savings. To achieve tensile and fatigue performance and reliability equal to the parts they replaced, fastener engineers, in effect, substituted improved metallurgy and design techniques for mass and weight.

These miniaturized parts were of immediate utility to missile and space ship designers. Yet, just as in life, each generation must step forward from the foundation of experience built by its predecessors. So while the missiles and vehicles of the Space Age are still being assembled with skills borrowed from supersonic airplane techniques, inevitably these, too, are not always the best or even a good enough answer, and

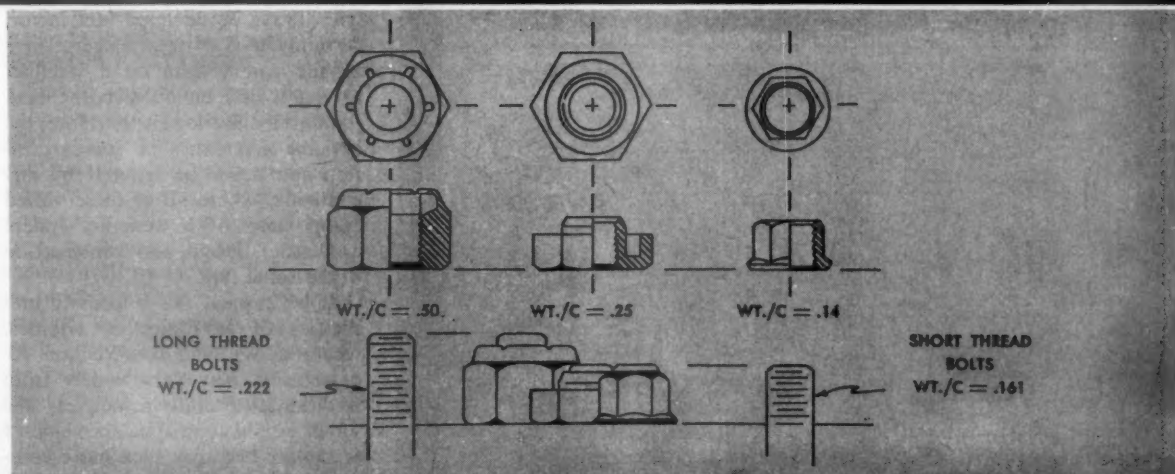
new requirements have been asserted. The locknut industry is now under pressure to obtain more strength, more reliability and more utility from the basic types and shapes already in common use; and to provide brand new solutions to some of the unique problems of the Aerospace Age and the industry devoted to exploring its mysteries.

It is interesting and informative, in a period of rapidly changing technology, to stand back and examine the progress made and to re-examine the tools at hand for any useful areas that may have been overlooked. To say "there is nothing new under the sun" is not always a resignation to possible progress, for it can sometimes mean the discovery, or rather rediscovery, of existing building blocks to progress.

Where in 1957, some in the fastener industry were greatly concerned with the condemnation of fastener systems which had served

continued

FIGURE 1



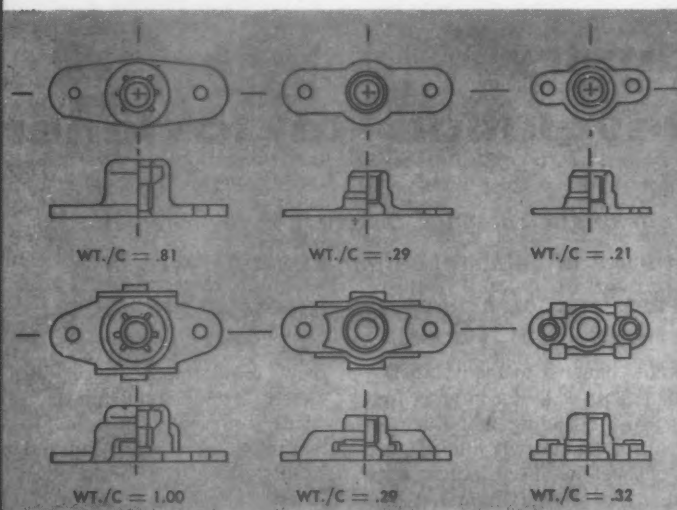


FIGURE 2

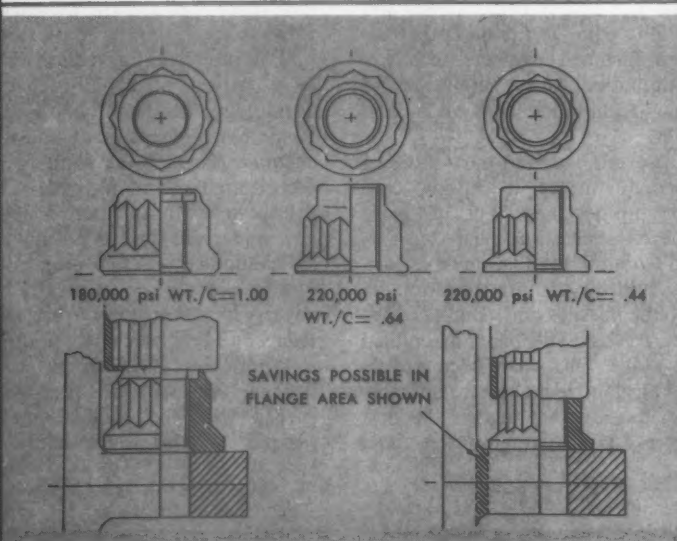


FIGURE 3

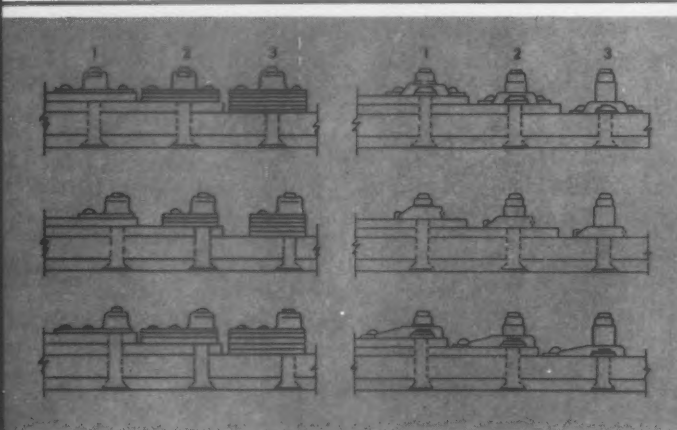


FIGURE 4

so reliably and so long, we are now very much concerned, with the technologies of parts to operate in environments which aren't likely to be really understood for several years. We are in a period of transition from a large group of mass-produced articles, with all the economic benefits and freedom of choice implied, to a much more highly technical product where the ultimate requirement may be in the dozens, not millions.

This situation points to a need for extremely critical review of each and every element in the fastening system. The fastener weight picture of the future is less likely to be evaluated on the basis of the fasteners themselves, but more probably on the basis of their various utilities in reducing structural weight, doing more of a job with fewer parts, or providing tremendously increased reliability, which in turn will permit lighter weight structural design.

The object of this discussion is to explore the various utilities required of today's threaded fastening systems. For a good foundation, let us examine first where we are today.

What are our fastener requirements today? To be practical about it, we must say they include all of the elements of strength, size, weight, reliability, and environment of yesterday plus a great deal more. For example we have now to consider materials and finishes from the one extreme of cryogenic conditions, to an obverse of temperatures in excess of 2000°F.

From a weight aspect, the modern weapons system begins to show a gradation of emphasis. While weight will always be an important factor, certainly it is of less concern on a missile gantry than on a satellite; or more vital on an airborne tank than a missile silo. Furthermore, the enticing economics of standardization can never be ignored by any company, where all of these varied components of a weapons system are under design and construction at the same time.

If we expand this selectivity into the field of electronics and avionics, where design and construction requirements may vary widely from traditional aircraft principles, the job of weight control balance against feasibility becomes even more complex.

Since more and more components

of today's weapons systems and aerospace vehicles are assembled with screws or bolts and hexagon nuts, and since these comprise far and away the bulk of the usage, Figure 1 illustrates the progress made just in the hex nut family toward weight reduction.

Perhaps next in importance is the plate nut or anchor nut varieties. The weight reduction progress here is shown in Figure 2.

Then there are the special high tensile types which are being used in greater and greater quantities in both vehicles and engines. We have made progress in this area as shown in Figure 3.

Figure 4 shows an illustration which will be familiar to those who have walked down an aircraft or missile assembly line. Around access doors and close-out panels there are thousands and thousands of steel and aluminum shims mounted under anchor nuts to provide for the use of constant length screws. While a much lighter combination nut and built-in thread relief has been available for several years, one still sees many, many pounds of excess weight carried around in shims. A whole family of these deep counterbore anchor nuts with all their utility is now available in one lug, two lug, corner, gang channel, and miniature types; in both 500°F and 900°F materials.

The bulk of the other general self-locking nut needs is provided by the NAS680-698, NAS1021-1041, and NAS1067-1068 standards which are manufactured by all major self-locking nut producers.

MINIATURIZATION AND AVIONICS FASTENERS

Miniaturization has become one of the Space Age's most used and, unfortunately, abused words. In truth, the science of space reduction, or miniaturization, is a three-dimensional concept. In the fastener field it goes far beyond the weight of the fastener itself to include consideration of closer structural clearances, better utilization of space, structural weight reduction, and sometimes even cost reduction. In Figure 5, some of these related space reduction factors are shown.

The design of avionics components seem to have one thing in common with air vehicles; that is, space and provision for the fastener

continues

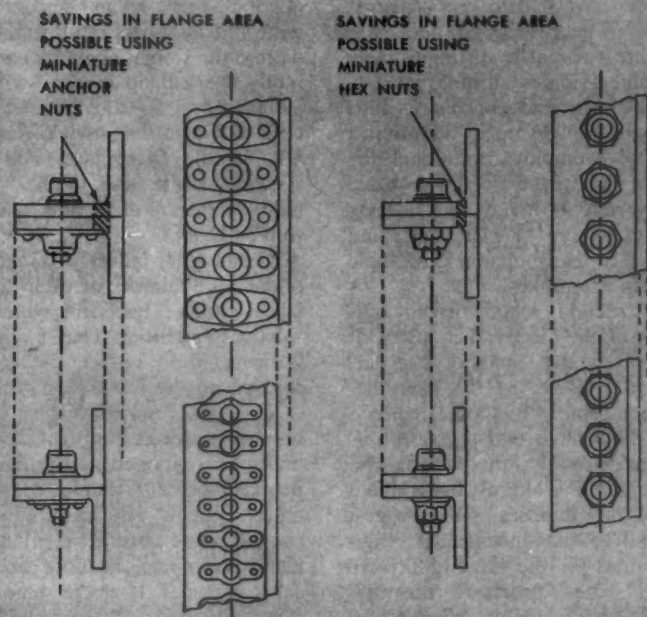


FIGURE 5

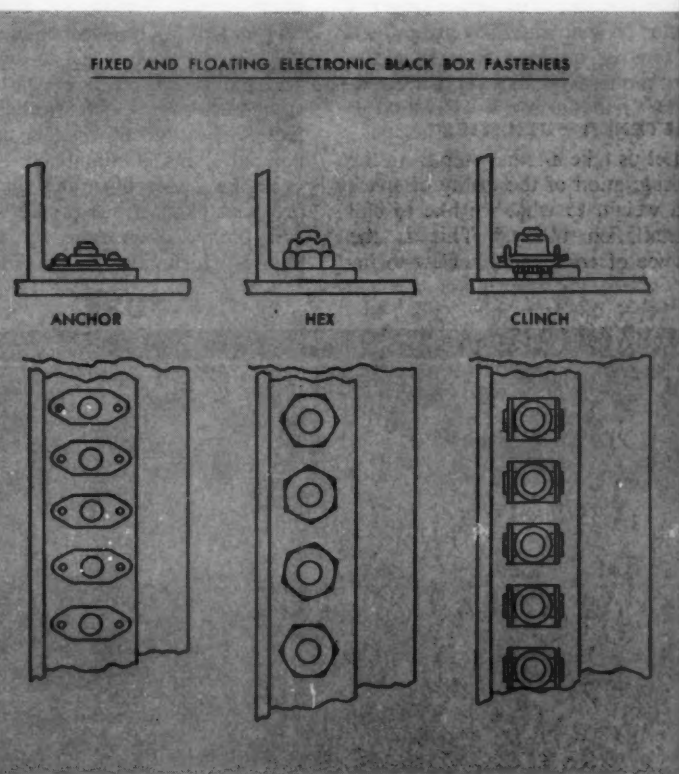


FIGURE 6

are left to the very last. As a result, the avionics people have become real experts in the science of space utilization, and the fastener manufacturers have had to keep pace. It has been interesting to note that there are two easily distinguishable electronic-avionics attitudes on fasteners. One originates primarily with designers brought up in the aircraft industry. It employs traditional aircraft practices; the riveting-in-place of a variety of fixed and floating types of anchor or plate nuts; and the use of gang channel, multiple nut strip assemblies.

The second school is an outgrowth of the electrical industry. It emphasizes the integral fastener, clinched-in-place, as the most desirable assembly method. Figure 6 shows how these two practices differ, and, frankly, the weight and size penalty the aircraft background orientation imposes. We suggest that all electro-mechanical engineers must be the ones to investigate fastener practices in their avionics work, for it is an established fact that religious adherence to aircraft principles can result in severe space and weight and cost penalties. The reliability of today's clinch nut fasteners is no longer a matter of concern. They are proven by tens of millions of uses in the most modern avionics yet conceived.

FASTENER "UTILITIES"

Let us take another step from the consideration of the utility of space and weight to what we like to call "installation utility." This is the science of component review to in-

sure that the job of fastening can't be done less expensively, or with fewer man-hours, or with greater effectiveness. This is called "cost reduction" by some and "value analysis" by others, and it seems to us that the weight engineer can currently, work hand in glove with the value analyst and the fastener engineer to insure that such reviews do not, in the first place, add substantial weight; and in the second place, reduce weight and space as well as cost.

The fastener industry has recently provided a number of such "installation utility" fasteners which are worthy of attention. One, a clip nut, is designed to reduce the cost of riveting nuts in secondary structure.

The value analyst has also turned his attention recently to the cost of multiple components, including the procurement and stocking costs. The more a single fastener component can be made to do, the more elements it replaces, the more economical it becomes. If at the same time, it reduces the weight of installation, even more is to be gained. Figure 7 shows two new fastener developments in this field. A "self-aligning" fastener has been created by combining a dish shaped and a curved base hex nut. The fastener tolerates up to 8° misalignments to simplify and reduce the costs of fastening components with non-parallel surfaces. Spot facing or the use of tapered shims is eliminated.

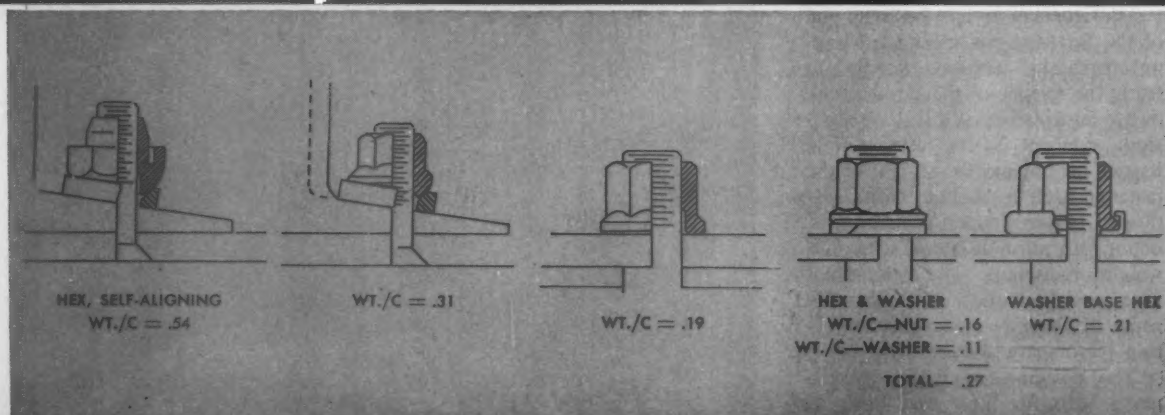
Figure 7 also illustrates dual approaches to the troublesome weight and bother of washers in a nut family which include an integral

washer; and another where the washer is completely replaced by an integral counterbore. These are multiple usage parts with large numbers used in structure, electrical terminals, and equipment so that any weight reduction per fastener, no matter how slight, is multiplied many times in the total usage.

In the high tensile area, where fatigue resistant nuts and bolts are required, we are in the midst of the first truly fundamental change in threaded fastener design in twenty-five years. By means of long and arduous research study, the true nature of the stress distribution in a nut and in the engaged threads of a bolt has been determined. Based on this knowledge, a new thread system for the nut, and a new method of processing a precision bolt have been developed. The nut has begun to improve reliability, extend life expectancy, and to permit use of higher stress levels in critical major fasteners. At a time when only the very best is good enough, it is possible to find some significant weight reductions in high tensile fastenings where two or more are being used to do the work of one, only because reliability of conventional parts is so erratic.

The preceding paragraphs have outlined only a few of the unusual or significant accomplishments of the "revolution in fasteners." And just as we have only begun to touch the fringes of our exploration of space, so have we only scratched the surface of the fastener developments that must and will come in the future. •

FIGURE 7





IN-PLANT WIRE DRAWING CUTS COSTS, UPS QUALITY OF ROLLER CHAIN PINS

These pins as well as the link plate and rollers are made by Chain Belt so they can exercise strict control over quality. To further improve quality, they installed an Ajax double-draw wire reduction unit.

Roller chain that is tougher and longer lasting is now being turned out at the Chain Belt Company's Roller Chain Division, in Springfield, Massachusetts.

The key to this stronger chain is in the pins which are drive-fitted in the link plates, and the recessed ends spun or headed over to complete the chain assembly. The pins, as well as the link plate and roller components, are made by the company so that it can exercise strict control over product quality.

The pin design calls for an extremely hard, wear-resistant surface backed up by a tough core for shock resistance, and with soft ends for upsetting. Chain Belt employs low carbon alloy steel for the pins, cold heading them to shape. The pins are tumbled and lightly ground to clean them up. They are then copper plated, finish ground to precision size, carburized, hardened and stress-relieved.

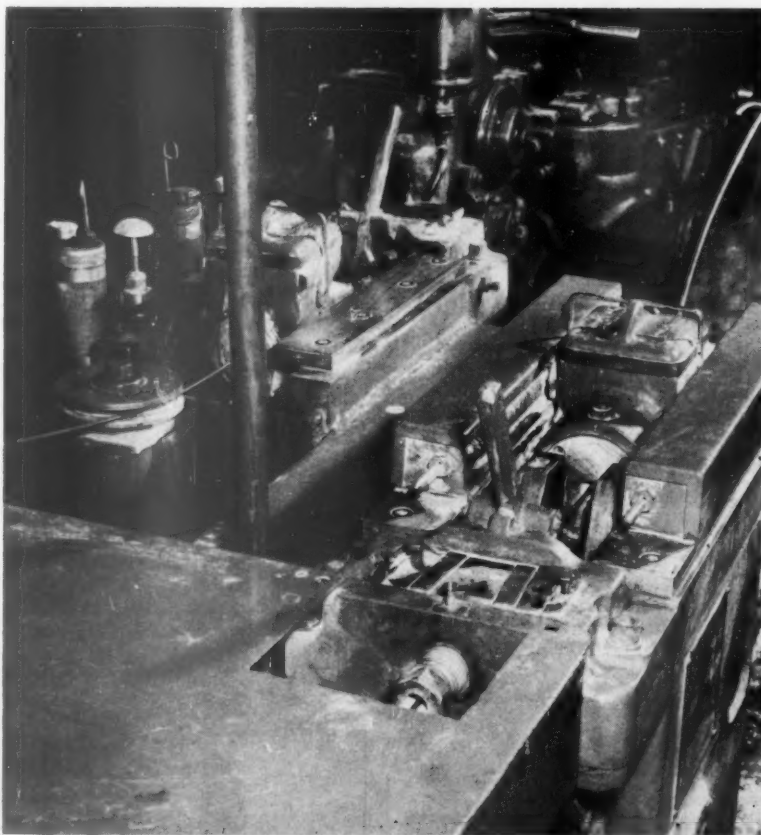
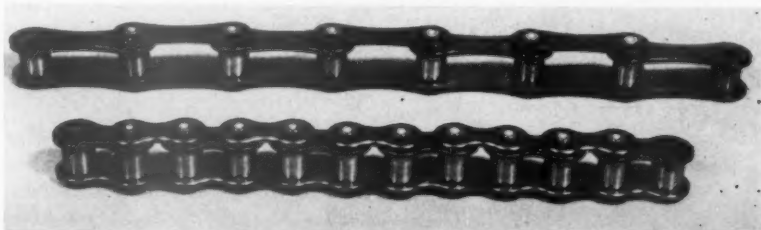
To keep grinding costs down, pins must come from the cold header within 0.005" of final size. This means that pins must be "blown up" or coined in the heading die from a smaller diameter to assure size constancy. Once the header has been set for a predetermined length of wire slug, the only variable that can influence final pin dimensions is the wire diameter. It was here that Chain Belt was having trouble, with slight variances cropping up in final pin dimensions.

Hot-rolled wire, supplied from the mill to meet company specifications, normally varies in diameter as much as ± 0.015 ". Although Chain Belt paid a premium for wire drawn to one-tenth this tolerance (± 0.0015 "), the variation was just too great.

When the wire diameter was undersize, the pin buckled or bent, instead of upsetting evenly over its full length. Centerless grinding left traces of copper, producing soft spots in hardening.

With oversize wire, excess metal squeezed out as flash at the header

continued



Each wire drawing head in this double-draw machine carries a die-holder positioned on a sliding way. Tungsten-carbide dies draw the wire to size. Completely surrounding the die inlet is a powder lubricant which assists in reduction of the wire without chatter or squealing.

ALL PALNUT® FASTENERS *must pass these*

3 TESTS OF FASTENER VALUE!

- ☒ Does it simplify and speed up the assembly job?
- ☒ Will it better fulfill all functional requirements?
- ☒ Can it be produced in large volume at low cost?

Among the dozens of quality-controlled PALNUT Lock Nuts and Fasteners, there's probably one or more that can save costs—parts—operations—space—weight—and assembly time on your fastening applications. And give your product dependable, vibration-proof tightness. Always check your designs with a PALNUT fastening engineer for opportunities to improve assemblies, with big savings in time and cost.

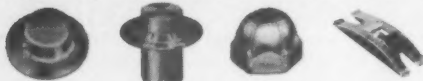
PALNUT Lock Nuts for threaded members • • • • A single PALNUT Lock Nut replaces ordinary nut, lock-washer, flat washer and sealer washer, according to application and type used. Cost less than ordinary nuts, save weight and space, assemble fast.



Self-threading Nuts for unthreaded studs • • • • Save threading costs. Form their own deep, clean threads while tightening on studs, rod or wire of any malleable materials. Fast assembly with standard tools. Vibration-proof grip.



PUSHNUTS® for unthreaded studs and rod • • • • Simply push on unthreaded studs, rod, wire or rivets. Strong spring grip resists removal. Save threading, grooving, drilling, cotter pins. Low in cost, fast assembly.



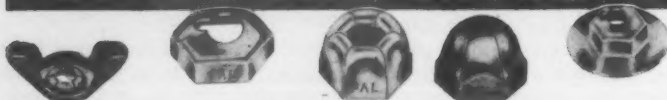
THE PALNUT COMPANY

DIVISION OF UNITED-CARR FASTENER CORPORATION
79 Glen Road, Mountainside, N. J.
Canada: P. L. Robertson Mfg. Co., Ltd., Milton, Ont.

WRITE for: detailed catalogs on PALNUT Lock Nuts, Fasteners and Tools. Describe application for free samples. See catalog in Sweets' Design File.



Reduce Cost • Reduce Parts • Speed Assembly • Maint. Security • Save Space • Save Weight



Use postpaid card. Circle No. 227

Wire Drawing, continued

die parting line. Extra tumbling was needed to clean the pins, and uneven grinding was sometimes the result. Occasional lots of wire were out of round, while others varied in size from high to low tolerance limits within a single coil. Frequent inspection of the pins, and constant adjustment of the headers required the attention of two men.

To help solve this problem, company engineers consulted with Ben Ware, chief application engineer for the Ajax Manufacturing Co. This resulted in Chain Belt installing a double-draft wire drawer to supply one header with wire sizes ranging from .0146" to 0.192" in diameter, by drawing down from a single No. 5 feed rod.

Now, with their own in-plant wire drawing process, Chain Belt is able to consistently hold tolerances tighter than ± 0.0015 " on mill-tolerance wire. Other benefits accrued. The headers are now adjusted only twice a week to compensate for wear on the drawing die. Fresh-drawn wire is straight, eliminating the previous problem of kinks (due to coil handling) causing the headers to jam. Formerly, rust and grit on stored wire caused header dies to wear out in two or three days; currently, header life is two to three weeks. Tumbling requirements are now normal, since no flash is produced; wire size is always right. Fresh-drawn wire is never out of round, so rejects previously due to uneven grinding of out-of-round pins are nil.

In addition, most sizes of wire needed can be drawn from only three standard mill sizes which are now purchased in large quantities to eliminate mill extras.



if you operate cold headers

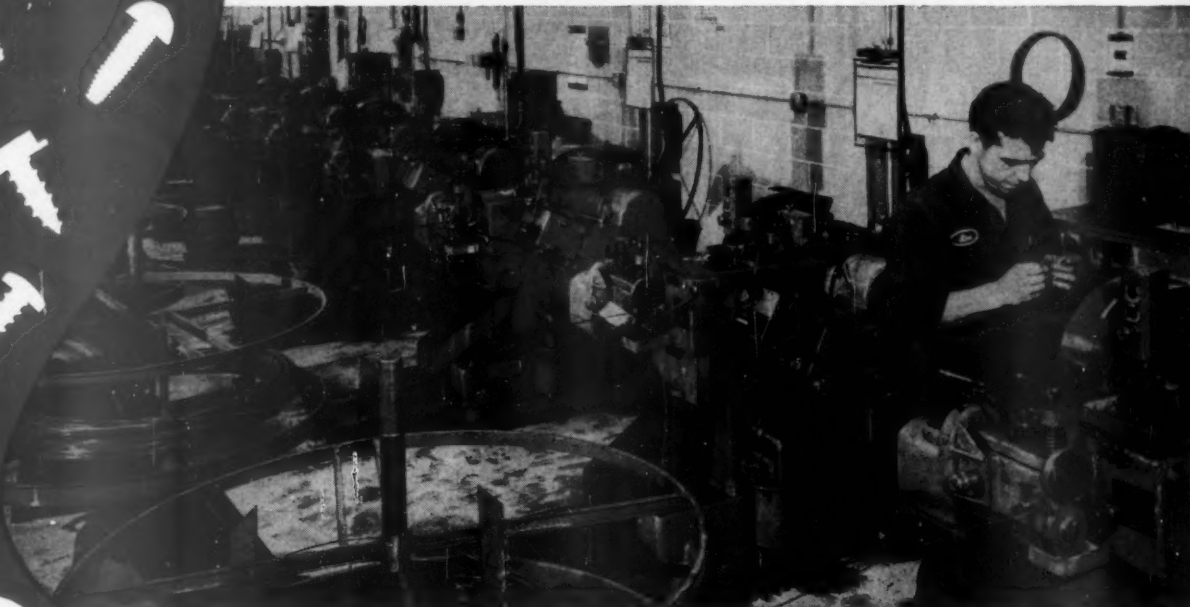


Photo Courtesy UNIVERSAL SCREW COMPANY, Evanston, Illinois

EXTRUDOIL

#51 DO Concentrate

is for you...

HERE ARE JUST A FEW OF
OVER 35 DIFFERENT MACCO PRODUCTS
COMPOUNDED WITH SPECIAL ADVAN-
TAGES FOR FASTENER MANUFACTURERS

Mac Draw #169
Tube Lube "B" • H.D. #14-C
Btu-Coat
Steel Klean • R.P. #10-A
D. & R. Compound #10-A
Burnishing Soap #6-A
Macco #472-MPA
Tumbling Compound #43-F

If you're interested in RESULTS, not just promises, you owe it to yourself to find out why Macco Extrudoil #51 DO Concentrate is **THE LUBRICANT** for cold heading. In plant after plant, throughout the fastener industry, it is being used, every day, for high volume, high quality production. REASON? Experience has dictated that Macco Extrudoil #51 DO Concentrate is the one lubricant that does the job best! It's that simple. Get all the facts and a trial from your Macco engineer. You'll see the many advantages other fastener manufacturers are now enjoying.

THE METALWORKING INDUSTRY LOOKS TO MACCO FOR LEADERSHIP

CLEANING COMPOUNDS
CUTTING LUBRICANTS

DRAWING COMPOUNDS
RUST PREVENTIVES
FORGING COMPOUNDS
EXTRUSION LUBRICANTS

MACCO
PRODUCTS COMPANY

9205 as S. SANGAMON ST., CHICAGO 20, ILL.
PRESCOTT 9-0800

Use postpaid card. Circle No. 213



BETTER WITH A SEELSKREW*

SEELSKREWS*, SEELBOLTS* and SEELRIVITS* are high-pressure, self-sealing, vibration-resistant fasteners for critical military and industrial applications. They are dimensionally interchangeable with standard fasteners, and maintain tensile, torque and shear strength of standard non-sealing fasteners.

We also make:

HEXSEALS*

Modular external seals that fit onto switches, potentiometers, circuit breakers and lighted push buttons.

APM PRODUCTS MEET
ALL APPLICABLE MIL SPECS.

Our list of modular seals is just too long for this ad. Let us send you our Catalog No. 359B.

*Trade Mark

Write or call: MISS RIVA SOLINS

**APM HEXSEAL
CORPORATION**

41 Honeck Street, Englewood, N. J.
LOwell 9-5700

Use postpaid card. Circle No. 258

AS RUDY SEES IT

Got a question, hallenge, puzzle to share or story to tell? Shoot it along, we'd like to meet you.



PRIMER FOR MODERNS

In this atomic-space age, there has been a rising demand for a new primer to meet the challenge of this super age. As a starter, may we suggest this four liner?—
E equals MC²
If the right kind of atom is paired.
And if the mass is made quite dense,
All of us will be past tense.

IT HAPPENS EVERY YEAR

"Everyone in this land can expect to be the victim of a major crime at least once in his lifetime, if he lives to be 60 years old", says N.Y. Senator Kenneth B. Keating. And there are some people who claim the event is an annual affair. It is called "Receiving neckties at Christmas time."

DEFINITION

Under Consideration—Never heard of it.
Under Active Consideration—We are looking in the files for it.

WISHFUL THINKING?

With Khrushchev's ordering the removal of Joseph Stalin from the Red Square memorial in Moscow, some of the wishful thinkers we know are taking heart in the observation that the memorial now has room for one more Communist dictator.

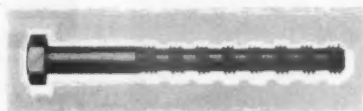
MATH OVER LIGHTLY

In the scale of 8, the addition of ATOM + BOMB = CHAOS utilizes a BOMB = 1 (mod 7) and produces a CHAOS which is a permutation of consecutive digits. Each letter uniquely represents a digit. Convert the letters into digits. (See answer on page 65.)

—Mathematics Magazine

HIGH SPEED BOLTS

Increased productivity is one of the big factors behind our high standard of living. That is one of the reasons the engineering staff of Dumont Industrial Screw has developed this new line of high speed bolts. With only half the usual number of threads, they require only half the time to run down and fasten. It is claimed that at least twice as many bolts per unit can be used without any increase in labor costs.



THE ART OF DOING NOTHING

If in answer to your question an R & D engineer claims to be working on nothing, don't misinterpret his words. Daily, new inventions and processes are bringing "nothingness" to greater heights. Just as a starter, consider these latest items to appear on the market: dirtless dirt for growing house plants, cordless appliances, just recently we read all about an invisible glass; and we suppose you could call all those employee fringe benefits payless pay.

DEFINITION

Table of Organization—Diagram of the Chinese Underground Telephone System.

LIMERICK CORNER

Said Rudy, your columnist, to all who would hear,
"Though my name is the same as that well-known deer,
The state of my nose
Is not ruby or rose,
But my greetings to you have the same Holiday cheer."

There was never yet a philosopher, who
could endure a toothache patiently—Shakespeare

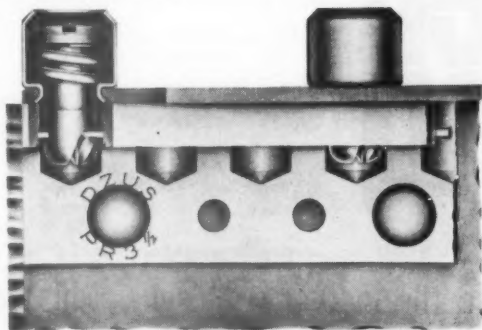
DZUS® FASTENERS

for fast - firm - dependable fastening...



STANDARD LINE

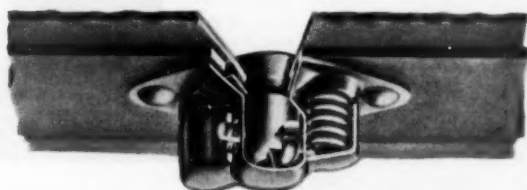
The Standard Dzus Fastener is the original quarter-turn self-locking fastener and it is still the most widely used aircraft fastener in the world. It was first applied to aircraft, but manufacturers in other industries quickly recognized its superior features and adopted it. Today it is used extensively in the electronic, transportation, communication, illumination, and photographic industries.



PANEL LINE

This fastener was developed to facilitate quick and easy installation of various length of panels on console units and racks. Panels varying in length by $\frac{3}{4}$ " increments can readily be affixed. Air Force Specification 7225 approved the use of this Panel fastener on airborne console units.

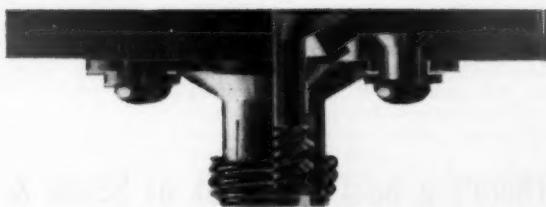
- ★ $\frac{1}{4}$ TURN ★ QUICK ACTING
- ★ SELF-LOCKING
- ★ VIBRATION-PROOF
- ★ LONG LIFE
- ★ PERMANENTLY ATTACHED



SUPersonic LINE

The Dzus Supersonic Fastener was developed to meet the severe requirements encountered in modern high speed military aircraft.

It was the first fastener approved under MIL-F-5991A(ASG) and is available in three sizes—200 lbs., 500 lbs. and 700 lbs.—rated tensile and shear loads.



UNIVERSAL LINE

This fastener has high tensile and shear characteristics and is recommended for use where no sheet separation is permissible under load. Approximately 270° rotation is required to lock it securely. Locking torque is normally 25 to 30 inch pounds, but this can be varied to suit the requirements.

LET DZUS SOLVE YOUR FASTENING PROBLEMS—

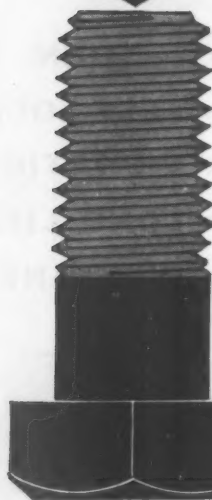
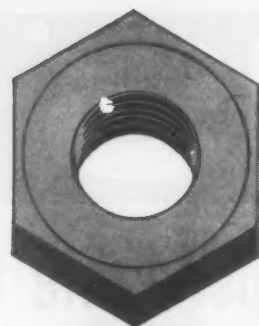


DZUS FASTENER CO., Inc.

**125 UNION STREET
WEST ISLIP, N. Y.**

Use postpaid card. Circle No. 229

OVER 6000
VARIETIES HAVE
BEEN PRODUCED.



**ma
gi-
neer
ing**

There's a bold, new look at Screw & Bolt. To the industrial designer, this new look means infinite design capability. Thousands of samples of specials we have made attest to our ability to make most any fastener you can design. Screw & Bolt's **Imagineering** is at your disposal, too! ■ Send for our booklet "Imagineering," and when you need threaded fasteners or parts, think of Screw & Bolt!

VMA 9887D



SCREW AND BOLT CORPORATION

OF AMERICA • P.O. BOX 1709, PITTSBURGH 30, PA.

Plants: Pittsburgh, Pa. Gary, Ind. Southington, Conn. Norristown, Pa. • Warehouses: Portland, Ore. Denver, Colo. Atlanta, Ga.

Imagineering . . . for greater fastener progress

Use postpaid card. Circle No. 230

Assembly & Fastener Engineering

WHAT'S NEW IN EQUIPMENT

For information on any equipment listed here, use the postpaid card opposite page 54. Just circle the number on the card matching the number following the description. We'll do the rest

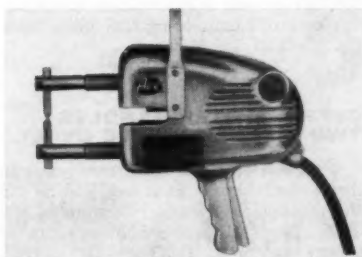
PORTABLE SPOT WELDER WITH BUILT-IN TIMER

A portable, resistance type spot welder with a built-in timer has a capacity of 3/16" for cold rolled steel and up to 1/8" combined thickness for stainless, galvanized and cadmium plated steel. Sheets, rods, bars and studs of many sizes and shapes can be welded, also.

In light production as many as 200 to 300 welds per hour can be made, depending upon the type and gage of material.

The electronic timer in the welder can be adjusted from 1/60 second to a full second. The welder also has a 100 ampere contactor, independently suspended and completely insulated transformer and up to 3" tip opening with 7" throat depth.

Ace-Sycamore, Inc., Sycamore, Ill.
Use postpaid card. Circle No. 1



See No. 1

a v-end for holding rounds and irregular shapes.

The holding pressure required for all applications can be developed by fingertip tightening. Pressure control is sensitive enough to permit the holding of objects as fragile as electronic tubes and as rugged as metal shapes.

United Associates, 1605 N. Hercules Ave., Clearwater, Florida.

Use postpaid card. Circle No. 3

MINIATURE PARTS HEADER HAS VARIABLE SPEED DRIVE

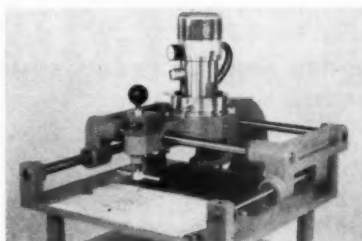
A double stroke cold header for miniature parts has a variable speed drive that allows instantaneous speed adjustment while the machine is in operation. By turning a hand dial the fly wheel speed can be adjusted between 150 and 300 rpm, permitting speed after a job is set up.

The Model 00 Aolid header is built into a desk type cabinet base having tool storage drawers and work-receiving pans. The machine is provided with a one-shot lubricating system.

Having a wire diameter capacity from .012" to .070", the header was developed particularly for the manufacture of tiny components such as electrical contacts, optical screw blanks, and other miniature rivet forms.

REM Sales Inc., 5010 Farmington Ave., West Hartford 7, Conn.

Use postpaid card. Circle No. 4



See No. 2

MACHINE SPEEDS MAKING OF CIRCUIT TRANSPARENCIES

A printed circuit layout machine speeds the accurate conversion of a printed circuit layout sketch into a full-size transparency with considerable savings in time and cost.

The Art-Mech eliminates the need for enlarged tape layouts and subsequent photo reductions. It requires only semi-skilled labor to operate.

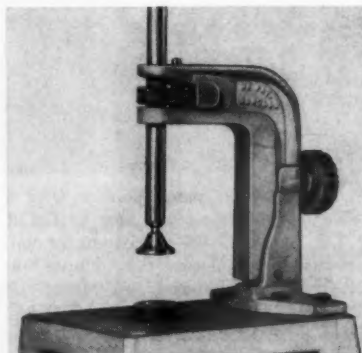
Melpar, Inc., 3000 Arlington Blvd., Falls Church, Va.

Use postpaid card. Circle No. 2

ASSEMBLY FIXTURE CLAMP HAS MANY PRODUCTION USES

An assembly fixture clamp is a fast-acting finger-tip control, threadless spindle, bench type holding device which has a wide variety of applications. It can be used in quality control, inspection, fabrication and assembly.

The United assembly fixture is equipped with a reversible steel base plate; one side is flat, the other has a v-notch. Two spindles are furnished, one with an anvil head, and one with



See No. 3

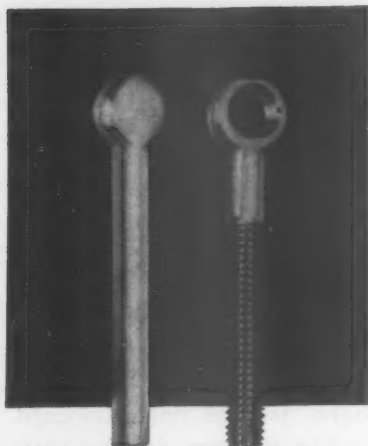
TOOL RETRIEVES PARTS FROM HARD-TO-GET-AT AREAS

A tool is designed to pull out various articles, such as tools, screws, etc., that have dropped into ordinarily inaccessible places.

The dual manual-magnetic retriever consists of a flexible shaft 13" long, through which a plunger is operated by compressing two metal discs at the handle end, opening four steel wire claws at the gripping end. Releasing the hand grip closes the claws around the object being retrieved.

Borroughs Tool and Equipment Corp., 2429 N. Burdick St., Kalamazoo, Mich.

Use postpaid card. Circle No. 5



STAINLESS STEEL Rod End* EYE BOLTS

- Rod Ends In Stock
- Fast Shipment

Now! Allmetal carries, in stock, quantities of rod end "blanks" ready for instant threading and drilling. Get mass production economy, highest quality, prompt delivery. Stock diameters 1/4" through 1/2" in varied lengths.

- * Head diameter of rod end is nominally two times the diameter of the shank. When requesting quotation, please indicate hole size and thread length.

STAINLESS THREADED RODS in stock
Diams. #2-1". Lengths 1, 2, 3, 6 ft.

STAINLESS STUDS - Full threaded, tap end, double end—fabricated promptly.

PLUS world's largest stock of stainless fasteners... all types.



Phone or write
nearest office for service.
Ask for catalog.

ALLMETAL®

SCREW PRODUCTS COMPANY, INC.

Manufacturers of Stainless Fasteners Since 1929

821 Stewart Avenue, Garden City, L.I., N.Y.
Phone: Pioneer 1-1200 TWX GCY 603

Midwest Division
6424 W. Belmont Avenue, Chicago 34, Illinois
Phone: AVenue 2-3232 TWX CG 3185

West Coast Division - Office and Warehouse
5822 West Washington Blvd., Culver City, Calif.
Phone: WEbster 3-9595 TWX LA 1472

Use postpaid card. Circle No. 231

INDEXING DRIVE UNIT HAS VERSATILE APPLICATIONS



A pre-engineered indexing drive unit can be adapted to cycling precision conveyors, transfer chassis and dial indexing machines.

The drive package features positioning accuracy, compact size, application versatility and high loading speed-torque capacities. The cam and roller internal components of the unit provide a modified trapezoid acceleration pattern for smooth and shockless indexing.

Visi-Trol Engineering Co., 12720 Burt Rd., Detroit 23, Mich.

Use postpaid card. Circle No. 6

CUFF INSERTER HANDLES TWO SIZES IN SINGLE CYCLE

A dual slot stator cuff inserter will insert both large and small cuffs in the same cycle. It will insert up to 150 cuffs per minute, either square or round bottom.

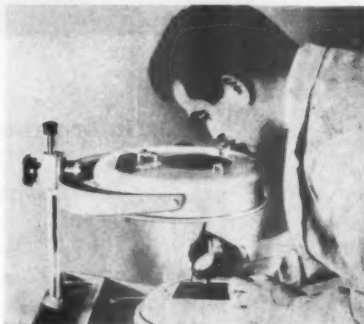
The machine indexes automatically, selecting either small or large slots in sequence, repeats the operation until all slots in the stator are filled, and stops automatically.

The SCM-45-2V cuff inserter loads quickly and easily from the top. An expanding mandrel clamps the stator to the machine. It can be adjusted for any stack height up to 4 1/2" by simply changing the width of the insulation paper used.

Possis Machine Corp., 825 Rhode Island Ave. S., Minneapolis 26, Minn.

Use postpaid card. Circle No. 7

OPTICAL SYSTEM EASES INTRICATE ASSEMBLY



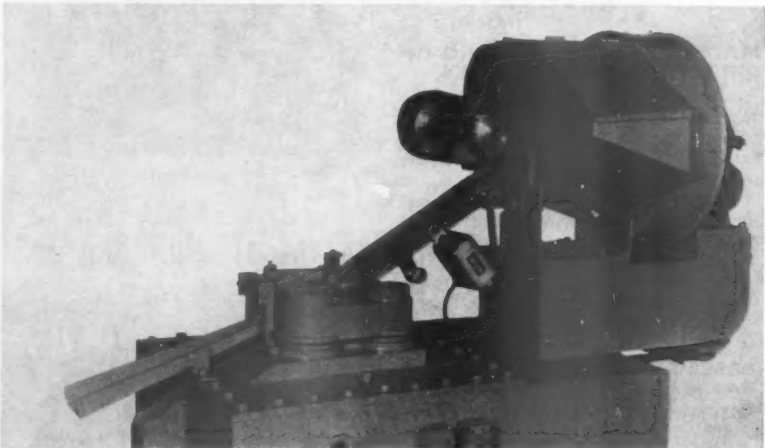
An optical system is designed to fill the gap between the microscope and the common magnifier. Demanding observations of quality control, precision machinery and delicate assembly, especially in miniaturization programs are possible with the Macro-scope.

Objects viewed are magnified on a flat field, without curves, barreling, pin-cushioning or distortions of any kind. Color transmission is true and clear.

EdnaLite Research Corp., 222 N. Water St., Peekskill, N.Y.

Use postpaid card. Circle No. 8

PINCH POINTER PRODUCES 400 PIECES PER MINUTE



A high speed pinch pointer with a wide latitude of sizes is now available.

The Model B-400 pinch pointer will produce 400 pieces per minute on all types of material which can be threaded, and in sizes from No. 2 through 281" dia. x 2 1/2" long, either countersunk or 90° shoulder heads.

The completely motorized rotary hopper has four speeds, while the pinching mechanism operates independently. Adjustments on the rails are made quickly.

Behr Machinery & Equipment Corp., 1210 Seminary St., Rockford, Ill.

Use postpaid card. Circle No. 9

APCO TORQUE TOOLS TO MEET EVERY REQUIREMENT



Apco Mossberg manufactures over 75 standard styles of torque tools ranging from an inch gram to 2000 foot pounds. In addition, they build many special tools for specific applications.

Every Apco torque tool is manufactured to rigid specifications to assure you the best available. They meet government standards, and are built to withstand 50,000 flexes without adjustment.

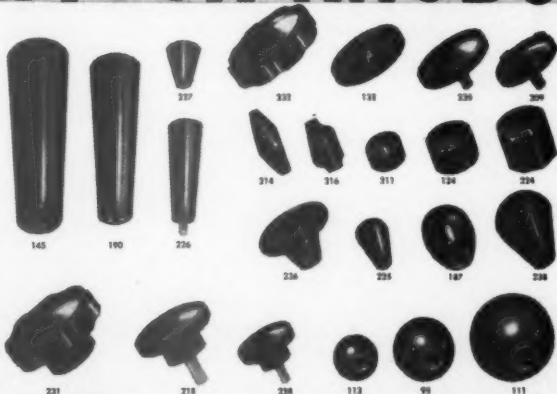
The Apco Mossberg Catalog of Torque Tools describes all styles, giving full information as to capacity, sizes and price. Write for your copy now.

- Special Purpose Wrenches
- Original Equipment Wrenches
- Torque Tools



STOCK KNOBS

...NO TOOLING CHARGE!



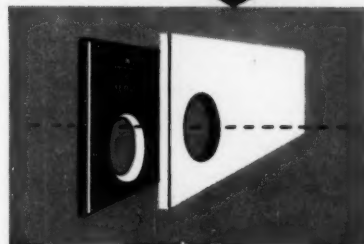
Wide selection molded plastic knobs, handles, hand-wheels at no tooling charge! Minor changes (inserts, threads, color, etc.) to suit requirements. Other modifications give your part a look of exclusive design at fraction of new mold cost! Write for complete illustrated catalog, or see Sweet's Product Design Catalog File.

DIMCO-GRAY COMPANY
210 EAST SIXTH STREET - DAYTON 2, OHIO

Use postpaid card. Circle No. 233

December, 1961

DON'T LET THIS



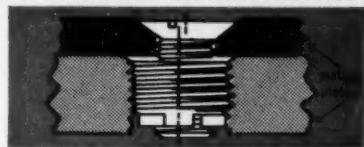
BoTHeR YOU!

WHEN THE HOLES DON'T LINE UP
USE FLOATING

KEENSERTS®!

You can save valuable dollars with these new "floating" Keenserts...they automatically compensate for misalignment (up to 0.040" for #10 and larger sizes). Available in 4-40 to 5/16-24 internal thread sizes. Check how new "floating" Keenserts can reduce your manufacturing and assembly costs. Write for catalog "C" TODAY!

An Absolute MUST for the ELECTRONICS Industry!



KEENSERTS automatically compensate for misalignment

EASY INSTALLATION—All Keenserts...the new "floating"...those with regular or self-locking threads...the miniature and sub-miniatures...and the standard Keenserts*...all are easily and quickly installed using:

STANDARD TAPS, DRILLS and GAUGES ■ ONE-PIECE UNITS ■ WILL NOT PULL OUT ■ AVAILABLE from STOCK ■ Lock Bolts Entered ONLY A FEW TURNS per MIL-N-25027 ■ Have Positive Lock Against Rotation!

*Standard Keenserts are stocked in internal thread sizes #2 through 1/2". Short delivery for special requirements up to 1 inch internal threads.

Call or wire your inquiry **COLLECT TODAY!**

NEWTON INSERT COMPANY

6500 Avalon Boulevard
Los Angeles 3, California
PLeasant 3-4271

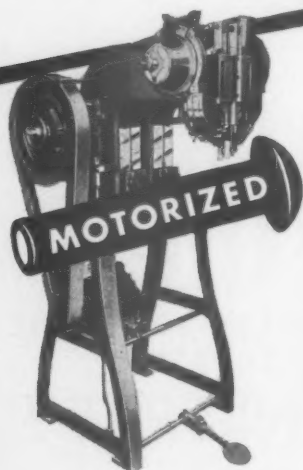
PAT. NO. 2,855,970.
OTHER PATS. PEND.

reliable fastening for ALL INDUSTRY

Use postpaid card. Circle No. 234

Why *Chicago Rivet* Offers TWO METHODS for Clinching Semi-Tubular Rivets

It is part of a widening service based upon industry's recognition that an assembly held together by semi-tubular rivets has great inherent strength and is usually lowest in production cost.



The Chicago Rivet **MOTORIZED AUTOMATIC RIVET SETTER** produces a sharp, solid blow that immediately upsets the tubular section. This method is used on 95% of all applications involving metals or non-fragile materials.

The Chicago Rivet **AIRPOWERED RIVETER** produces a cushioned, shock-free clinch on a tubular rivet, permitting riveting of fragile and uneven materials. This method has greatly widened the use of semi-tubular rivets.



FOR YOUR FILES



RIVET CATALOG describes 1388 standard tubular and split rivets and 25 single and multiple motorized automatic rivet setters.



AIR-POWERED RIVETING catalog contains description and specifications of 8 single and multiple riveters—also rivet setters designed for automated operation.

Why not let Chicago Rivet Fastening Engineers tell you which system is best for you. No obligation.

MOTORIZED

Line includes automatic single, multiple and automated setters.

AIR-POWERED

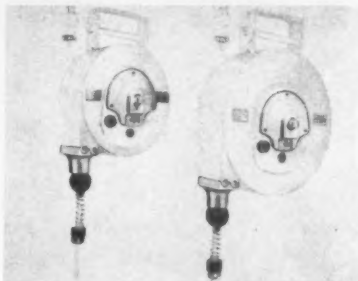
Line includes automatic single, multiple and automated setters.

**Chicago Rivet
& MACHINE CO.**

946 So. 25th Ave., Ballwood, Ill.
(Chicago Suburb) Branch Factory:
Tyrone, Pa.

Use postpaid card. Circle No. 225

ELECTRIC CORD REELS IN 2 SIZES FOR INDUSTRIAL USE



Industrial duty electric cord reels are made in two sizes. Both reels are constructed of heavy gage materials and feature simple installation and maintenance free operation.

The No. 925 is equipped with a 20' or 25' cord, and the No. 945 has 35' or 45' of cord.

Daniel Woodhead Co., Dept. ECR, 15 N. Jefferson St., Chicago 6, Ill.

Use postpaid card. Circle No. 10

AIR-POWER PLIERS FOR ELECTRONIC ASSEMBLY



A multi-purpose air-powered pliers has use in the manufacture of electrical and electronic components and circuits.

In production test runs, the "Air-plier" has increased output up to five times that achieved with hand tools performing the same operation; and at the same time it reduced operator fatigue. It weighs 7¼ ounces, is 6" over-all in length.

Also available with the tool are four interchangeable heads, one head each for diagonal and square cutting, a head which cuts and swages at the same time and another designed for cutting plastics, such as gates and flashing.

Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, Ohio.

Use postpaid card. Circle No. 11

ELECTRONIC WELDER HAS DUAL RANGE



A solid-state, capacitor-discharge welder power supply has full circuit switching for each of two ranges. Maximum versatility in this voltage

FOR YOUR CONVENIENCE You are invited to use these convenient postage free reader service cards to obtain literature and further information found in the advertising and editorial pages. Simply circle the number of the item in which you are interested.

DECEMBER 1961 (not valid after February 28, 1962) READER SERVICE

Please have information sent me on all items I have encircled.

ADVERTISEMENTS									
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330

EDITORIAL ITEMS									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160

Please Print

Your name _____

Title _____

Company _____

Address _____

City _____

Zone _____

State _____

Products manufactured _____

No. Employees _____

Do you wish to continue to receive Assembly & Fastener Engineering? _____

Yes _____ No _____

What article in this issue interested you most? _____

What subjects would like to see published in future issues? _____

FIRST CLASS

Permit No. 272

Wheaton, Illinois

BUSINESS REPLY CARD

No postage stamp necessary if mailed in the U.S.

Postage will be paid by

assembly & fastener

ENGINEERING

Hitchcock Building

Wheaton, Illinois

Readers' Service Department

DECEMBER 1961 (not valid after February 28, 1962) READER SERVICE

Please have information sent me on all items I have encircled.

ADVERTISEMENTS									
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330

EDITORIAL ITEMS									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160

Please Print

Your name _____

Title _____

Company _____

Address _____

City _____

Zone _____

State _____

Products manufactured _____

No. Employees _____

Do you wish to continue to receive Assembly & Fastener Engineering? _____

Yes _____ No _____

What article in this issue interested you most? _____

What subjects would like to see published in future issues? _____

FOR YOUR CONVENIENCE You are invited to use these convenient postage free reader service cards to obtain literature and further information found in the advertising and editorial pages. Simply circle the number of the item in which you are interested.

FIRST CLASS
Permit No. 272
Wheaton, Illinois

BUSINESS REPLY CARD

No postage stamp necessary if mailed in the U.S.

Postage will be paid by

assembly & fastener

ENGINEERING

Hitchcock Building

Wheaton, Illinois

Readers' Service Department

DECEMBER 1961 (not valid after February 28, 1962) READER SERVICE Please have information sent me on all items I have encircled.

ADVERTISEMENTS										EDITORIAL ITEMS									
301	302	303	304	305	306	307	308	309	310	1	2	3	4	5	6	7	8	9	10
211	212	213	214	215	216	217	218	219	220	11	12	13	14	15	16	17	18	19	20
221	222	223	224	225	226	227	228	229	230	21	22	23	24	25	26	27	28	29	30
231	232	233	234	235	236	237	238	239	240	31	32	33	34	35	36	37	38	39	40
241	242	243	244	245	246	247	248	249	250	41	42	43	44	45	46	47	48	49	50
251	252	253	254	255	256	257	258	259	260	51	52	53	54	55	56	57	58	59	60
261	262	263	264	265	266	267	268	269	270	61	62	63	64	65	66	67	68	69	70
271	272	273	274	275	276	277	278	279	280	71	72	73	74	75	76	77	78	79	80
281	282	283	284	285	286	287	288	289	290	81	82	83	84	85	86	87	88	89	90
291	292	293	294	295	296	297	298	299	300	91	92	93	94	95	96	97	98	99	100
301	302	303	304	305	306	307	308	309	310	101	102	103	104	105	106	107	108	109	110
311	312	313	314	315	316	317	318	319	320	111	112	113	114	115	116	117	118	119	120
321	322	323	324	325	326	327	328	329	330	121	122	123	124	125	126	127	128	129	130
										131	132	133	134	135	136	137	138	139	140
										141	142	143	144	145	146	147	148	149	150
										151	152	153	154	155	156	157	158	159	160

Please Print

Your name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Products manufactured _____ No. Employees _____

Do you wish to continue to receive Assembly & Fastener Engineering? _____ Yes _____ No _____

What article in this issue interested you most? _____

What subjects would like to see published in future issues? _____

FIRST CLASS
Permit No. 272
Wheaton, Illinois

BUSINESS REPLY CARD

No postage stamp necessary if mailed in the U.S.

Postage will be paid by

assembly & fastener

ENGINEERING

Hitchcock Building

Wheaton, Illinois

Readers' Service Department

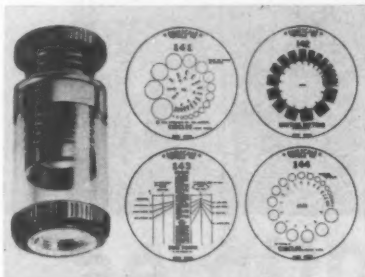
regulated unit is achieved by rapid switching from a low range of .04 to 9 watt-seconds to a high range of 2 to 45 watt-seconds.

Typical applications for the Model 1059 include fine whisker-wire attachment to semiconductor leads, micro-component lead attachment in deposited thin-film circuitry and connecting component leads to circuit ribbon in high-density packaging.

Weldmatic Division, Unitek, 950 Royal Oaks Drive, Monrovia, Calif.

Use postpaid card. Circle No. 12

TRANSPARENT SCALES FOR MAGNIFYING COMPARATOR



Four new transparent scales are added to the 20 already available for use in the Finescale Magnifying Comparator, for the measurement of small dimensions, and comparing shapes of small objects.

The scales are the No. 141 covering 17 open circles from .005" to .125" dia. No. 142 for bars varying from .1mm to 2.0mm in width by increments of .1mm. The No. 143 for checking the sharpening of small drills. It shows the correct point angle and lip clearance for drilling various metals. The No. 144 checks open circles from .1mm to 2.0mm by increments of .1mm.

Finescale Company, 218 S. Western Ave., Los Angeles 4, Calif.

Use postpaid card. Circle No. 13

LOAD 4000 NEEDLE BEARINGS PER DAY WITH MANUAL UNIT



A manual needle bearing loading machine is designed to load upward of 4000 needle bearings per eight hour day.

With one operator, the machine loads



Tiny Bristol socket screw is held by Pegasus Labs Chief Engineer Charles E. Ikerman.

Bristol's Multiple-Spline Socket Screws have

"...far superior staying power"

That's the report we get from Pegasus Laboratories, Berkley, Michigan, manufacturer of high-precision servo valves for guided missiles, tape-programmed machine tools, and a variety of other equipment.

"Not only must our servo valves function exactly right every time," says Chief Engineer Charles E. Ikerman, "but they must do it under a range of operating conditions which impose almost fantastic demands on every part. . . . Not only did Bristol's Multiple-Spline socket screws surpass all the previous ones in regard to maintenance of original adjustment, but that very quality quite naturally produced a significant improvement in the durability and reliability of our servo valves, making them far less subject to failure, and better qualifying them for long service applications."

This experience reflects the almost universal approval we've received from users of the famous Bristol Multiple-Spline socket screw. Superior holding power under shock and vibration, ability to withstand repeated tightening and loosening, and complete immunity from stripped sockets are qualities that users frequently mention.

Bristol manufactures the most complete socket screw line on the market—including industry-standard hex as well as Multiple-Spline sockets—in a range from No. 0 gauge to 1½".

Ask your authorized industrial distributor for complete information on Bristol socket screws. He can help you select the right socket screw for your job, and he carries a wide variety of types in stock for immediate delivery.

A.1.5



Special No. 2-56 Bristol Multiple-Spline socket screws shown greatly enlarged.

Precision socket screws since 1913... by the makers of famous Bristol Precision Instruments

Bristol's Hex Socket Screws

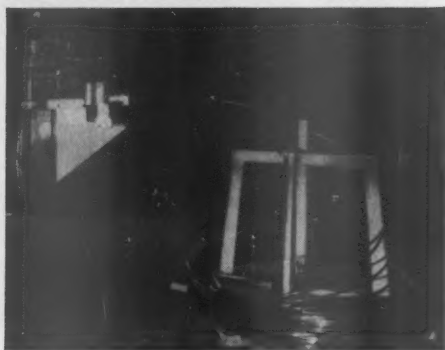
Bristol's Multiple-Spline Socket Screws

"Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diameter."

THE BRISTOL COMPANY

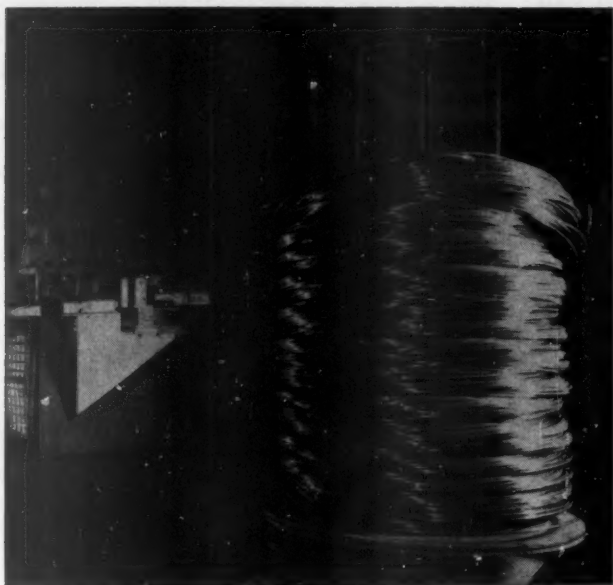
Socket Screw Division
Waterbury 20, Conn.
A SUBSIDIARY OF AMERICAN CHAIN & CABLE COMPANY, INC.

Use postpaid card. Circle No. 234



Why set up ten times...





.....when once will do ?

It's a simple matter to add up the savings heavy-weight wire coils can give you. How much time does it take you to shut down a machine and start a new coil through? Multiply that by the number of times you have to do it in an 8-hour shift. Then figure that as much as 90% of that lost time is sheer waste. Because you could be using AS&W heavyweight coils that contain up to ten times as much wire in one continuous length. **Other savings:** less handling, less storage space needed, even lower scrap loss. Heavyweight coils aren't the only road to cost reduction: *American Steel and Wire offers a dozen different wire packages.* One of them is designed just right for your operation. Let us look at your set-up and recommend the best package . . . a simple step to increased production. Call our nearest sales office or write American Steel and Wire, Dept. 1491, Rockefeller Building, Cleveland 13, Ohio.

Innovators in wire



**American Steel and Wire
Division of
United States Steel**

Use postpaid card. Circle No. 237

all standard needles into wings, gears, wheels, cups and other such parts.

Constructed of heat-treated alloy steel, the unit measures 6x8 inches and is 13 inches high.

N&N Machine Co., 1114 S. Blue Island Ave., Chicago, Ill.

Use postpaid card. Circle No. 14

PORTABLE STUD WELDER FOR CRAMPED AREA WORK

A lightweight welding machine for fastening insulation pins or studs to ductwork, tanks and curtain walls consists of two basic units, a welding cabinet weighing 38 lbs and a pistol grip welding gun.

Operating on power supplied from standard 110v ac outlets, the Model 7000 welds pins to steel, stainless steel or aluminum.

The unit is easily handled on scaffolding and in cramped working quarters.

Omark Industries, Inc., 9701 SE McLoughlin Blvd., Portland 22, Ore.

Use postpaid card. Circle No. 15

DIRECTIONAL VIBRATORY UNIT FOR ASSEMBLY USE

A drive unit provides directional vibratory conveying movement to a cushioned track, trough or responsive surface, level or inclined for the purpose of moving small, and even minutely formed parts. It is especially suited for operation in conjunction

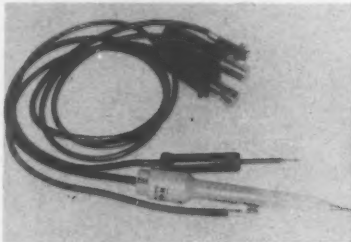
with processing and assembly machines.

The Vibra-Drives have electromagnetic vibratory motors operating from a rectified 60 cycle ac producing 3600 vibrations per minute. The power, or amplitude of vibration can be regulated from high to low by turning the rheostat knob.

Syntro Company, 820 Lexington Ave., Homer City, Pa.

Use postpaid card. Circle No. 16

PENCIL PROBE TOOL FOR PIN-POINT WELDING



A pressure sensing pencil probe type welding handpiece has been designed to facilitate small, pin-point welds entirely from one side of the work surface.

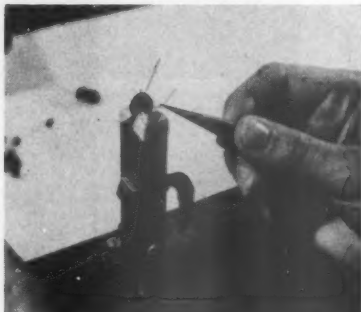
The VTA-43 includes both a pressure sensing weld probe and a ground probe. The probe is adjustable to fire the weld energy at preset pressures ranging from one-half to five pounds, permitting welds of consistent quality

on hard-to-get-at metal applications.

Hughes Aircraft Co., Vacuum Tube Products Div., 2020 Short St., Ocean-side, Calif.

Use postpaid card. Circle No. 17

PRECISION TWEEZERS FOR ELECTRONIC USE



A complete range of Dumont and Boley style, as well as many EREM, tweezers are now available from stock. A total of 75 different varieties enables the solving of any electronic assembly problem that might arise.

Most models are available in regular carbon steel, stainless and a special anti-acid and anti-magnetic stainless. A few special models are available in nickel, silver and brass.

R. N. Hunter Sales Co., 9851 Albutus Ave., Santa Fe Springs, Calif.

Use postpaid card. Circle No. 18

LEWIS



PATENT APPLIED FOR

Lewis Plastibox storage and assembly systems are proven space-savers. One-piece molded plastic, smooth, strong, non-rusting, unaffected by oil and water. Widest variety of sizes, mounting methods, and accessories for complete versatility. A new brochure contains complete story; why not write for it?

Lewis ships within 24-hours from receipt of your order!

G. B. LEWIS COMPANY • 2012 Montgomery Street • Watertown, Wis.

Use postpaid card. Circle No. 238

Assembly & Fastener Engineering

FAST HEATING IRON PERMITS CLOSE WORK SOLDERING



A soldering iron can be held so close to the work, the distance from hand to work is under 2".

The unit has an over-all length of 5 7/8", with a Durotherm coated tip 1/32" dia. It is available in many different point shapes, and also with 1/16" and 1/8" dia. tips.

The iron consumes 12 watts, and reaches working temperatures of 550°F in less than 2 minutes; and 700°F in less than three minutes. Present models are available in 115v ac and dc.

Hexacon Electric Co., 635 W. Clay Ave., Roselle Park, N.J.

Use postpaid card. Circle No. 19

SINGLE SPINDLE MACHINE SETS 3/16" TUBULAR RIVETS

A single-spindle rivet-setting machine handles semi-tubular rivets up to 3/16" in diameter and 1" long in heavy-duty long-run production. It has a stroke of 3 1/2", allowing more space for loading components and unloading riveted assemblies.

Other major specifications of the Model 310 rivet-setting machine include a throat depth of 12", anvil height averaging 42", 10" diameter hopper, single revolution roller clutch and

crank driven toggle setting mechanism.

The Milford Rivet & Machine Co., 857 Bridgeport Ave., Milford, Conn.

Use postpaid card. Circle No. 20

ULTRASONIC CLEANER HAS AUTOMATIC POWER CONTROL



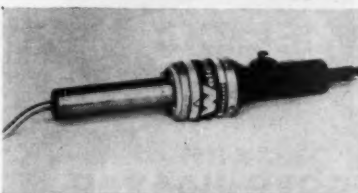
A five-gallon ultrasonic cleaner operates from a 5-ampere input. The cleaner develops a generator peak output of 1200 watts at 40 kc, and 4000 watts at 20 kc. The higher peak produces an impact that cleans with high speed. Since power is produced at 20 kc and 40 kc, energy is distributed evenly throughout the entire tank in both the horizontal and vertical planes.

The Cavitator 20/40 features an electro-strictive transducer, automatic timer, and automatic power control. Generator and transducer are so designed that tuning is unnecessary.

Mettler Electronics Corp., 114 W. Holly St., Pasadena, Calif.

Use postpaid card. Circle No. 21

HOT AIR WELDING TOOL FOR THERMOPLASTIC MATERIALS



Electro-hot air welding tools are designed for rapid, low cost welding of vinyls, polyethylene and other thermoplastic materials.

The Model L P S is a featherweight welding tool weighing only one pound. It is ideally suited for experimental work and regular production welding. The tool may have its air supplied by a regular compressed air system or by special radial blowers which are available.

Weldotron Corporation, 907-R Frelinghuysen Ave., Newark, N.J.

Use postpaid card. Circle No. 22

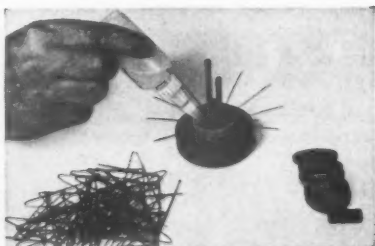
WELDING POWER PACK HAS HIGH PRODUCTION OUTPUT

A power pack for multiple spot welding with high production output of small weldments offers single cycle operation of one or more spot in rapid sequence.

The Model 60-T is especially suited for high output automatic feed units.

With Eastman 910 Adhesive...

Strong rubber-to-rubber bonds in 8 seconds



Ever see an electric rodding mouse? Chicago Pneumatic Tool Company makes one. It scampers through underground ducts pulling its tail (a cable puller) behind it at 150 ft. per minute. Rows of vibrating nickel-alloy tines held fast between rubber discs help drive the mouse along duct walls. Each disc

is bonded to its neighbor in 8 seconds, with just two drops of Eastman 910 Adhesive, using only contact pressure. Bonds are stronger than the rubber itself! And no heat, no solvent, no catalyst are required for this quick, efficient bonding job.

Eastman 910 Adhesive will form bonds with almost any material. Send \$5 for a trial kit and try it on your toughest job. Kits and further information are available from Armstrong Cork Company, Industrial Adhesives Division, Lancaster, Pa.; or from Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company, Chemicals Division, Kingsport, Tennessee.

Here are some of the bonds that can be made with Eastman 910 Adhesive

Among the stronger: natural rubber, SBR, Buna N, most types of neoprene; vinyls, phenolics, cellulotics, polyesters, polyurethanes, nylon; most woods; steel, aluminum, brass, copper. Among the weaker: polystyrene, polyethylene, and fluoro-hydrocarbon plastics (shear strengths up to 150 lbs./sq. in.).



There is no adhesive like Eastman 910 Adhesive

SETS FAST—Makes firm bonds in seconds to minutes.

VERSATILE—Joins virtually any combination of materials.

HIGH STRENGTH—Up to 5,000 lbs./sq. in. depending on the materials.

READY TO USE—No catalyst or mixing necessary.

CURES AT ROOM TEMPERATURE—No heat required to initiate or accelerate setting.

CONTACT PRESSURE SUFFICIENT.

LOW SHRINKAGE—Virtually no shrinkage on setting as neither solvent nor heat is used.

GOES FAR—One-pound package contains about 14,000 one-drop applications.

The use of Eastman 910 Adhesive is not suggested at temperatures above 175°F., or in the presence of extreme moisture for prolonged periods.

See Sweet's 1961 Product Design File 10d/Ea.

Use postpaid card. Circle No. 239



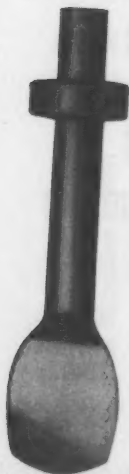
COLD-HEADED SPECIAL PARTS FLATTENED AND BENT

Right, there are three bends in this special connector for jalousie windows, and two grooves in one end. It is made of 16-18 stainless steel and held to close tolerances.

ACTUAL SIZE

Right, this chrome-plated handle for a familiar kitchen utensil is formed, bent, and flattened to take a plastic handle on one end and a spatula blade on the other.

ACTUAL SIZE



Left, this collared and flattened piece, which appears in an automobile fuel pump assembly, is held to close dimensions and accurate centering of flat end.

ACTUAL SIZE

SEND PRINTS OR SAMPLES

We are prepared to quote promptly on all work requiring special operations such as those shown here. Write for samples of Elco products.

ELCO TOOL AND SCREW CORPORATION
1101 Samuelson Rd., Rockford, Ill.

Use postpaid card. Circle No. 240

The air actuated timing controls have 100 amp contactors and can operate the transformers in single sequence or in pairs.

Ampower Products, 10207 S. Ridgeland Ave., Chicago Ridge, Ill.

Use postpaid card. Circle No. 23

ELEVATOR HOPPER ORIENTS, FEEDS AND COUNTS PARTS

A high speed, parts orienting and feeding, as well as counting unit has an elevator hopper with a roller type orienting and feeding track. The new track employs the same principle as is used on the high speed Count-O-Matic Model E electronic screw counter.

The hopper permits the unscrambling and feeding of items such as aerosol valve assemblies, large bolts and screws up through 8" in length and 1" in diameter, and cylindrical objects that require orientation in an end to end position regardless of ratio of length to diameter.

Count-O-Matic, Inc., 40-24 22nd St., Long Island City 1, N.Y.

Use postpaid card. Circle No. 24

VACUUM COATING SYSTEM AND EVAPORATOR

The features most often specified by experienced users of thin-film, high-vacuum coating equipment have been built into a bell-jar vacuum evaporator.

The Series 2100 Model VSC-20 is a self-contained 32" desk-high console.

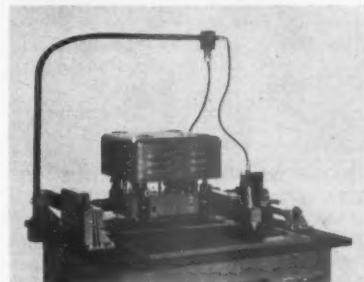
It is designed for laboratory use and small-parts production coating in electronics, optics, infrared and semiconductor fields.

The console is arranged to permit the operator to view the work and instruments, to manipulate all controls, and to service the cold trap from a single standing or sitting position.

Vacuum Specialties, Inc., 34 Linden St., Somerville, Mass.

Use postpaid card. Circle No. 25

DRILLS 4 PRINTED CIRCUIT BOARDS AT SAME TIME



A high-precision circuit board drilling machine lends itself to both long and short run production. When stack drilling on four spindles, precision clean-wall and burr-free holes are produced at the rate of 25,000 an hour. Hole location is maintained within .001" of true template position.

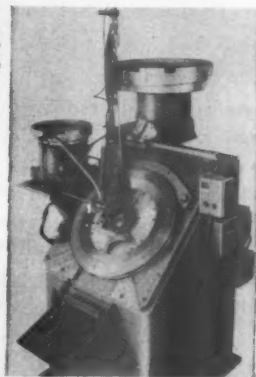
TOWNSEND of HARTFORD designs and builds automatic machines to meet customers requirements

TOWNSEND is the recognized leader in design and manufacture of automatic machines to meet customers requirements. The TOWNSEND line of Qualimatic Machines performs a full range of machining operations which means greater productivity at reduced costs—specific savings in manpower—and greater accuracy... all at minimum capital investment.

Send your machining and production problems to Townsend of Hartford. Our engineering department can help you achieve the answers. No obligation!

TOWNSEND automatic coordinates many operations into ONE Increases Production 6 Times Decreases Man Hours 5 Times

T-236 TOWNSEND automatic assembly machine inserting nail and stud type fasteners into washers at a rate of 72 per minute. Vibratory type hoppers are used in the feeding of the washers and nails or studs with interchangeable orienting devices provided for various styles of fasteners. Parts are fed into continuous operating rotary table with insertion being accomplished by a cam arm, adjustable for lengths varying from 1/8" to 3" long. Assembled parts are then automatically discharged toward the front of machine.



The H. P. TOWNSEND MANUFACTURING CO.

BROOK ST., WEST HARTFORD 10, CONNECTICUT

Use postpaid card. Circle No. 241

Assembly & Fastener Engineering

The Quad-Drill is a free-moving coordinate axis machine which permits two directional positioning of a central drill head over desired locations. Each axis is equipped with brakes which are automatically applied during the drilling cycle.

Excellon Industries, 5002 Crenshaw Blvd., Los Angeles 1, Calif.

Use postpaid card. Circle No. 26

MULTI-FACED HAMMER HAS REPLACEABLE TIPS

Replaceable tips of multi-faced hammer allow one tool to do the work of many, from sledge power to precision sensitivity.

The Shure-Drive can be fitted with five interchangeable and replaceable tips of varying degrees of hardness. The tips, each colored to conform with federal specifications of durometer hardness, are compounded of plastic and are secured in steel collars.

Ramset Fastening System, Winchester-Western Div. of Olin Mathieson Chemical Corp., 289 Winchester Ave., New Haven 4, Conn.

Use postpaid card. Circle No. 27

REVERSIBLE RATCHET WRENCH WITH 1/4" SQ. DRIVE

A reversible ratchet wrench is available in 1/4", 3/8" and 1/2" square drives with two handle lengths in the 1/2" drive.

Features of the 90 series include a narrow head, thumb-operated revers-

ing lever, ball-and-spring reversing lever stop to prevent accidental shifting and easy ratcheting action. All wearable parts can be individually replaced.

Armstrong Bros. Tool Co., 5203 W. Armstrong Ave., Chicago 46, Ill.

Use postpaid card. Circle No. 28

SOLDER MELTING UNITS FOR DIPPING OPERATIONS

Standard and custom solder melting units are available in sizes and shapes for a variety of applications.

Rectangular shaped units are particularly suited for dipping operations in printed circuitry fabrication.

All Sta-Warm units are equipped with a blanket-type heating element which distributes heat evenly at minimum watt density to bottom and side-walls.

Sta-Warm Electric Co., Ravenna, Ohio.

Use postpaid card. Circle No. 29

HAND OPERATED RIVETER FOR FASTENING ALUMINUM

A re-designed rivet gun is manufactured entirely of steel and is claimed to be easier to operate than previous models.

The Model PG-200 is recommended for fastening aluminum jacketing around pipe covering, tanks, towers and other equipment requiring aluminum protection.

Insul-Coustic Corp., 42-23 54th Road, Maspeth 78, N.Y.

Use postpaid card. Circle No. 30

NO TANGLE-NOTCH COIL

brazing rings

Snap OFF COIL

PLACE ON PART

Preformed No Tangle-Notch Coil Rings end wasted time in placing silver solder in position for brazing operations. Rings fit quickly and accurately on parts to be joined. Cut and try methods and resulting rejects are eliminated. Silver solder is actually metered to flow evenly — positive bond. Ring Diameters from 1/4" to 12" — +.001. Wire Sizes .020 to .093.

NO TANGLING

NO DISTORTION

NO WASTE

Write for 16 page booklet on better brazing.

LUCAS-MILHAUPT Engineering Co.

5060 South Lake Drive, Cudahy, Wisconsin

Use postpaid card. Circle No. 242



COLD-HEADED THREAD-CUTTING SCREWS STANDARD AND SPECIAL



Left, the large head on this Type F Special Thread-Cutting Screw is tapered and has a Phillips recess, TWICE SIZE



Above, This recessed hexagon washer head Standard Thread-Cutting Screw is Type F for use in light or heavy metals, TWICE SIZE



Left, an odd, headless Type F Special Thread-Cutting Screw which features a blunt point, multiple cutting edges, and threads like a machine screw, ACTUAL SIZE



Left, this Type F Special Thread-Cutting Screw is notable for a complex head which has a tapered flat portion with extended hex driver, ACTUAL SIZE

OTHER ELCO PRODUCTS

TAPPING SCREWS
SEMS

SMALL SCREWS

MACHINE SCREWS

PIPE PLUGS

MACHINE SCREW NUTS

CAP SCREWS

LAG SCREWS

DRIVE SCREWS

SPIN LOCK

WOOD SCREWS

PHILLIPS HEADS

FREARSON HEADS

CLUTCH HEADS

COLD-HEADED PARTS

SEND BLUEPRINTS OR SAMPLES

We are prepared to quote promptly. Write for samples of Elco products.

ELCO TOOL AND SCREW CORPORATION

1101 Samuelson Rd., Rockford, Ill.

Use postpaid card. Circle No. 243

WHAT'S NEW

IN FASTENING AND JOINING

For further information on any of the fasteners or methods use the handy postpaid card opposite page 54.

2-PART EPOXY PACKAGED IN SMALL AMOUNTS CUT WASTE

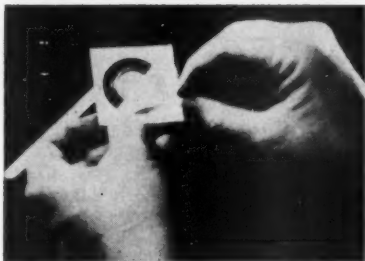
Epoxy cement in 1/10 oz. two component mixer-packages solves the problem of accurately mixing small quantities of short pot-life epoxies without waste or mess.

Catalyst and resin are sealed in a vacuum-formed polyethylene container resembling individual jelly service used in restaurants. The epoxy may be mixed in the package.

The two parts of the epoxy are of contrasting colors, permitting a visual indication of even mixture.

Plastic Associates, PO Box 36, Laguna Beach, Calif.

Use postpaid card. Circle No. 45



See No. 45

SELF-LOCKING NUT FOR 1400°F APPLICATIONS

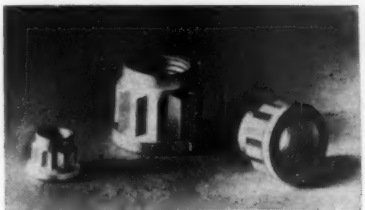
An elevated temperature locknut made of Waspalloy, a nickel-base alloy, is intended for use with high performance bolting at temperatures up to 1400 degrees Fahrenheit.

The FN 1418, a one-piece self-locking nut, has properties which make it possible to utilize the full potential of high-strength 1200° and 1400° F bolts.

Principal applications of the new locknut are on jet and rocket engines, missiles, gas turbines, and other high-temperature power generation equipment.

Standard Pressed Steel Co., Box 1121, Jenkintown, Pa.

Use postpaid card. Circle No. 46



See No. 46

CAM-ACTION DRAWER HANDLES FOR CABINETS

Electronic drawer handles feature finger tip action in opening and closing electronic chassis drawers equipped with rear-mounted connectors.

The Power-Lock handles assure positive engagement and accurate connector alignment. Each handle is designed with a recessed lever which cams the last 3/4" drawer travel with a



See No. 47

mechanical advantage of 6.6:1. Cam action is particularly applicable where multiple connector usage requires substantial force for engagement and disengagement.

Jonathan Manufacturing Co., 720 E. Walnut Ave., Fullerton, Calif.

Use postpaid card. Circle No. 47

HEAVY DUTY TERMINALS CUT VIBRATION BREAKAGE

Designed to resist heavy vibration that fractures standard terminals, heavy duty solderless electrical units are formed from a heavier .050" stock. They were originally developed for heavy construction machinery, but provide economical extra protection against terminal failure in any application where high vibration is found.

The ETC heavy duty line is supplied in over 200 styles, types and sizes, both insulated and non-insulated.

ETC Incorporated, 990 E. 67th St., Cleveland 3, Ohio.

Use postpaid card. Circle No. 48

ADHESIVE OFFERS HIGH HEAT RESISTANCE

A one-part, pressure sensitive adhesive designed for producing automotive, electrical, and similar tapes, features high-heat resistance. After cure, non-creep qualities and medium peel and shear strengths are achieved.

Bostik adhesive, No. 2105, is recommended for producing pressure-sensitive tapes or stocks for any end usage that must resist high temperature for prolonged periods without lifting or creeping.

B. B. Chemical Co., United Shoe Machinery Corp., 140 Federal St., Boston 7, Massachusetts.

Use postpaid card. Circle No. 49

COMPOUND CUTS AFTER WELD CLEANUP TIME

A complete water soluble and ready-mixed spatterproofing compound, applied with brush prior to welding, pre-

vents spatter from adhering to areas surrounding the weld zone. It contains no oils, varnishes, or other volatile substances. It is non-toxic and will not burn, smoke, or flake.

Typical applications include aircraft and missile parts and assemblies, all types of sheet metal fabrication, stainless steel products and other exposed metal surfaces.

Effective wet or dry, the compound can be applied hours prior to welding. After welding, spatter in treated area wipes clean with a dry cloth.

Cleanweld Products Co., 9220 South Atlantic Blvd., South Gate, Calif.

Use postpaid card. Circle No. 50

NYLON INSERTED IN CLAMPS PREVENTS SHAFT MARRING

A nylon insert in clamps produces uniform pressure and prevents marring of shafts and hubs. They are resilient and shock absorbing.

The clamps are available in $\frac{1}{8}$ " to $\frac{3}{16}$ " shaft sizes. The 85 different types cover balanced, unbalanced, gear, hinged, pull and swivel clamps and are manufactured to plus or minus .001".

Sterling Instrument Div., Designatronics, Inc., 5 Sintsink Drive, Port Washington, L. I., N. Y.

Use postpaid card. Circle No. 51

COTTERLESS PIN FOR TEMPORARY HITCHING

A cotterless pointed hitch pin, made of cadmium plated steel, is ideal for

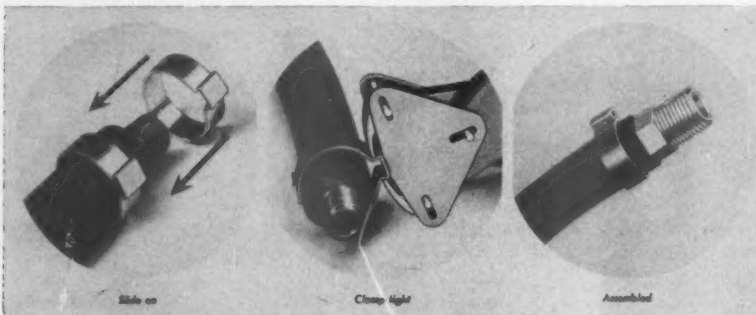
temporary or interchangeable hitching of parts, tools, units and assemblies. The working parts of the self-locking feature are of stainless steel.

The pointed end of the pin facilitates the proper alignments of the two holes, and the large head provides a means of quick removal.

Rein Leitzke, Dept. HP, Hustisford, Wisconsin.

Use postpaid card. Circle No. 52

LOW PROFILE HOSE CLAMP INSTALLED WITH HAND TOOL



A hose clamp of the "take-up-lug" type assumes a low profile keystone shaped head upon closure. The head makes the clamp particularly adaptable to applications calling for installation in close quarters and areas where a large protrusion would be undesirable.

The Keystone clamping ring has a wide band which distributes clamping

BAR SOLDER IS FREER FROM OXIDE FORMING ELEMENTS

A bar solder is significantly free from oxide-forming elements. As a result, Alpha Vaculoy solder cuts dross, increases bath life, reduces inherent inclusions, improves wetting and produces brighter joints.

Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J.

Use postpaid card. Circle No. 53

pressure over large areas and reduces the tendency of cutting or abrasion on hose surfaces. Installation is made with a simple air or hand tool, which takes up the lug, and at the same time compresses the metal into a compact head.

Cuyahoga Products Corp., 1600 N. Woodward, Birmingham, Mich.

Use postpaid card. Circle No. 54

Something **NEW** you should know about!

FEEDMATIC-DETROIT AUTOMATED EQUIPMENT

Now, you can speed small parts production and cut costs with new Feedmatic electrically controlled machines. These units automatically and continuously feed, inspect, segregate or assemble parts at greater efficiency . . . reduce handling costs on high volume operations. Use Feedmatic automated machines separately or for high speed delivery to machine tools, heat treating furnaces or final assembly areas.

If your operation involves the manufacture or processing of parts in volume quantities, it will pay you to investigate the cost saving advantages of Feedmatic automated equipment. Send us your problem today!

FEEDMATIC-DETROIT, INC.

P.O. BOX 115-B • SOUTHFIELD, MICHIGAN

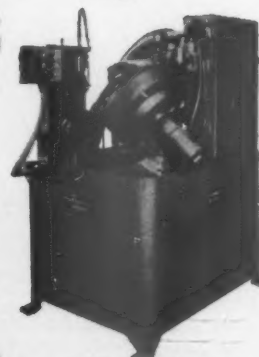
Automatic Gaging Machine measures and sorts parts. Adjustable stops, anvils and gage heads to facilitate change over to different size parts. Tolerance of electrical gages adjustable from .0005 to .020.



Model 12F Floor Hopper. Parts storage capacity, 12 cubic feet. For automatic feeding of larger parts.



Rotary hopper unit. Fast, efficient parts feeding. Available in sizes from 8" to 24". Feed tracks engineered to meet specific job conditions.



Special machine for automatically assembling automotive components.



SECURE YOUR
PRODUCT QUALITY
with

HUBBELL

*COLD HEADED—ROLLED THREAD

FASTENERS



Hubbell c/h* turns
out parts faster,
better and at
less cost than screw
machining ever could
... they're stronger,
more accurate and
more uniform.

Don't be a slave to
screw machine waste!
Check Hubbell c/h*
today. Free part
analysis. No
obligation.

HARVEY

HUBBELL,

INCORPORATED

MACHINE SCREW DEPARTMENT
BRIDGEPORT 2, CONNECTICUT

Use postpaid card. Circle No. 246

December, 1961

LOCK NUT KIT FOR PROTOTYPE DESIGN USE

Self-locking nuts, packed in a special kit assortment is particularly useful for on-the-job machine shop use, maintenance departments and prototype design.

The No. 700 kit has more than 250 plated carbon steel self-locking nuts in thread sizes ranging from 4-40 to 10-24 and 1/4-28 to 1/2-20.

Each of the 12 sections of the unbreakable plastic box contains standard and thin height hex nuts in the coarse and fine thread series. The kit is priced at \$15.00, postpaid in the U. S.

Elastic Stop Nut Corporation of America, Dept. AD-N700, 2300 Vauxhall Rd., Union, N. J.

Use postpaid card. Circle No. 55

TEFLON COATED SEALS HAVE LOW FRICTION COEFFICIENT

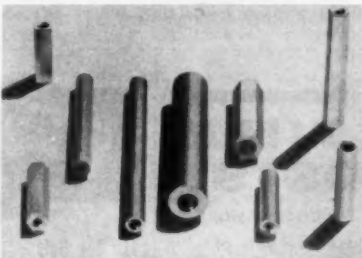
Molded rubber o-rings, v-rings and u-cups are coated with teflon to reduce running friction and breakout.

The teflon is finely applied on the outer seal wall only. Coefficient of friction is reduced to between 0.05 to 0.07.

Seals East Orange, Inc., 393 Central Ave., East Orange, N. J.

Use postpaid card. Circle No. 56

STANDOFFS, SPACERS, AND POSTS FOR ELECTRONIC USE



Tubular spacers used for separation or support of components or structural members in electronic assemblies have precision machined ends and accurately controlled lengths. They are available in round, square or hexagonal outside diameters. A choice of aluminum, brass, corrosion-resistant steel or cold rolled steel is available.

Angler posts are designed to support and separate components or structural members without the need for long screws or machine nuts.

Angler Industries, Inc., 75 Winthrop St., Newark 4, N. J.

Use postpaid card. Circle No. 57

Answer to problem on page 48. Traditionally we start with CHAOS, and note that there are only three values it can have (scale of 8 and consecutive digits). A little digging reveals $4037 + 6376 = 12345$.

CORRECTION

On page 147 of Hitchcock's Assembly & Fastener Directory, McLaughlin's address should read:

The McLaughlin Company
214 Jaikins Bldg.,
Birmingham, Michigan.

ONE STEP BLIND RIVETING

!

The new,
easy solution
to difficult
fastener
problems



New one-step, "touch and go" blind expansion riveting takes just a touch of heat and the job is done . . . instantly! Developed by DuPont, this new idea in fasteners is safe, simple and economical. All you need is a soldering iron.

- One unskilled operator can set up to 25 per minute — even in blind applications.
- Fasten metal, wood, rubber, fibreboard, plastic, tubing, etc.
- No expensive tooling — all you need is a soldering iron.
- Multiple heating elements placed in a simple jig, simultaneously fire any number of rivets.
- Safe, positive sealing; shank expands along full length for wider grip range.
- No finishing operation required.
- Simple, one-piece design.
- Brazier or countersunk head.
- Available in brass, chrome plated brass, aluminum, stainless steel.
- Tamper proof.

Send for details

THE BOWMAN PRODUCTS CO.

Industrial Division

850 East 72nd St. • Cleveland 3, Ohio

Exclusive distributors:



Industrial Blind
Expansion Rivets

Use postpaid card. Circle No. 247

STAINLESS ALLOY WELDING WIRE IN SPOOLS



Welding wires of stainless alloy types 308, 309, 310, 316 and 347 are now available in 1-lb plastic disposable spools and in 25-lb pressed board disposable spools for automatic welders.

The alloys are also available in 3 ft. rods for hand-held welders. The reels and rod bundles are individually cartoned. Wire diameters range from .035 to .187"

National-Standard Co., 601 N. Eighth St., Niles, Michigan.

Use postpaid card. Circle No. 58

ADHESIVE SPEEDS ASSEMBLY OF CUSHIONING MATERIALS

A fast-grabbing, solvent type, sprayable tacky cement speeds the assembly of cushioning and insulating materials. It is designed to hold large bulky sheets of padding and insulation firmly in place prior to strapping, stitching,

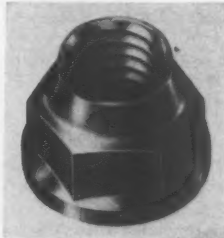
tacking, stapling or other permanent bonding operations.

Anktac requires only one-side application by brush or spray. By preventing materials from moving about prior to final assembly, it saves time and labor normally required for repositioning.

Anchor Adhesive Corp., 36-23 164th St., Flushing 58, N. Y.

Use postpaid card. Circle No. 59

TORQUE LOCKNUT RESISTS FATIGUE FAILURE



Basic design features of a prevailing torque locknut allows adequate deformation of its "turret top" without overstressing any portion of the periphery, giving them high resistance to fatigue failure.

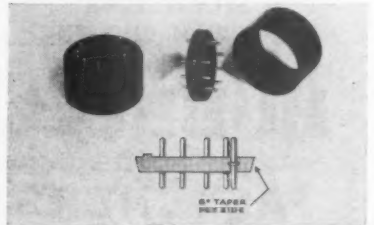
Through a controlled heat treatment, Lokon locknuts have a degree of elasticity which permits re-use time after time without significant impairment of the locking action.

Presently available in sizes from No. 10 to 1/2", UNC and UNF threads, the nuts have a tensile strength in excess of 250,000 psi and temperature resistance to 550° F.

Allen Manufacturing Co., PO Drawer 570, Hartford 1, Conn.

Use postpaid card. Circle No. 60

SEMICONDUCTOR HEADER HAS LEAKPROOF FIT



A new header design has a 6° tapered edge to provide a tight fit between the header and the case. The tapered fit prevents liquid encapsulant from leaking out of the case.

The header fits standard 9-pin tube sockets and can be used for mounting plug-in modules, semiconductor networks, logic networks and memory cores.

Standard units are made of glass diallyl phthalate with molded-in gold plated pins. Outside diameter of the header is .700".

They are also available in mineral

HOW TO CUT ASSEMBLY TIME AND COSTS!

Ask National! Years of producing the world's lowest cost in-place fasteners assures you of qualified assistance in obtaining fastenings that will cut costs and speed assembly!

THE FOUR BIG ADVANTAGES NATIONAL OFFERS

★ Engineering Service

National is Headquarters for fastening problems. By the same token, National is Headquarters for fastening solutions!

★ Low Equipment Cost

Buy or lease depending upon the job or capital requirements.

★ Quality Rivets

National has the facilities and equipment to give you the right rivets for lowest cost in-place fastening.

★ Speed of Assembly

Automatic riveting equipment can be used with excellent speed and results even by unskilled or semi-skilled help!

Send a blueprint or product itself to National for a prompt and dependable answer to your assembly problem.



Bulletin No. 137 describes and lists industrial rivets. Write for your copy.

NATIONAL RIVET & MFG. COMPANY
211 MAIN STREET • WAUPUN, WISCONSIN

Use postpaid card. Circle No. 248



JACK NUT

SCREW ANCHOR

The Only Blind Fastener Which Grips Any Material From 0" To 3/4" Thick

EASY TO INSTALL

1. Insert anchor into hole. Needs only 1/4" expansion space.
2. Run in screw to collapse spider anchor backing by exerting pull on threads.
3. Anchor now is installed and ready to receive attachment screw.

Made of quality steel, cadmium-plated. Grips evenly on rough as well as smooth surfaces. Provides vibration-proof assembly. Weight-carrying capacity is limited in most cases only by strength of the material in which used.

Sold By Wholesale Hardware, Electrical Wholesale & Industrial Supply Distributors

MOLLY CORP.
230J N. 5th St., Reading, Pa.

SPECIFICATIONS						
CAT. NO.	CAP. DIA.	CAP. THICK.	BODY DIA.	9/16" L/16"	THREAD	MAX. UPRD
4-5. JN	15/32	3/64	9/32	9/16	6-32	43/64
4-6. JN	15/32	3/64	9/32	3/4	6-32	43/64
4-7. JN	17/32	1/16	3/8	11/16	10-24	25/32
4-8. JN	17/32	1/16	3/8	7/8	10-24	25/32
4-9. JN	5/8	1/16	27/64	3/4	1/2"-20	13/16
4-10. JN	5/8	1/16	27/64	15/16	1/2"-20	13/16

*6-32 and 10-24 threads available
**10-24 and 12-24 threads available

Also available in brass and stainless steel

U.S.A. Pat. No. 2,964,999

Use postpaid card. Circle No. 249

Assembly & Fastener Engineering



SECURE YOUR
PRODUCT QUALITY
with

HUBBELL

STANDARD
COLD HEADED — ROLLED THREAD
FASTENERS



Stocked to assure rapid delivery of the largest orders. Quality control assures clean threads, well-formed heads, deep, clean slots, uniform size.

Sizes from #2 to 3/8". Lengths from 1/8" to 3". Available in all metals, finishes and head shapes—slotted, Phillips, slotted Sems, and Phillips Sems.

Write or call—

HARVEY
HUBBELL

INCORPORATED
MACHINE SCREW DEPARTMENT
BRIDGEPORT 2, CONNECTICUT

Use postpaid card. Circle No. 250

December, 1961

epoxy, mineral phenolic and mineral alkylid with either gold or tinned-copper leads.

Epoxy Products Division, Joseph Waldman & Sons, 137 Coit St., Irvington, N.J.

Use postpaid card. Circle No. 61

PIN-TO-SOCKET INSERTS FOR BULKHEAD CONNECTIONS



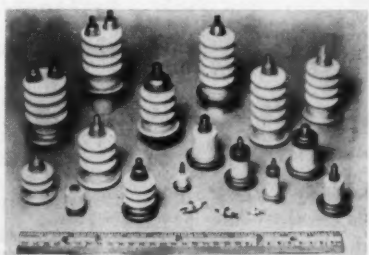
A hermetically sealed connector with pin-to-socket contact inserts has applications where an environmental seal must be maintained through a bulkhead. The connector greatly facilitates checkout and maintenance, since none of the wiring need be disconnected.

The insert design features a combination of full compression glass on the pin side, and a resilient silicone insert on the socket side. Both inserts have positive contact identification. They are available in three shell styles: square flange, solder and hex nut mounting. Contact configurations are from 3 to 37 contact combinations.

The Deutsch Co., Electronic Components Division, Municipal Airport, Banning, Calif.

Use postpaid card. Circle No. 62

ALUMINA CERAMIC-TO-METAL TERMINALS WITHSTAND 27 KV



A line of alumina ceramic-to-metal terminals for hermetically sealed electronic equipment is suitable for service up to 1700° F.

The Advac line consists of 20 standard sizes ranging from 5/16" dia. up to 1 1/4" dia. They are rated in accordance with Mil-T-27, and will withstand flashover voltage in excess of 27 kv. The metal hardware is pure silver brazed to the ceramic. The terminals can be assembled by soft soldering, brazing or welding.

Advanced Vacuum Products, Inc., 430 Fairfield Ave., Stamford, Conn.

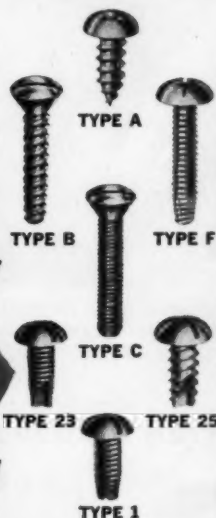
Use postpaid card. Circle No. 63



SECURE YOUR
PRODUCT QUALITY
with

HUBBELL

COLD HEADED — ROLLED THREAD
TAPPING AND THREAD CUTTING
FASTENERS



All types are uniform in size, heat treated to highest torque limits. They feature sharp, well-formed, full-bodied threads and deep, clean slots.

Sizes from #2 to 3/8".

Finishes: nickel, cadmium, zinc, brass, bronze, chrome, Parkerizing, Iridite, blued.

For details, write or call—

HARVEY
HUBBELL

INCORPORATED
MACHINE SCREW DEPARTMENT
BRIDGEPORT 2, CONNECTICUT

Use postpaid card. Circle No. 251

67

TERMINALS FOR WIRE WRAP OR DIP SOLDERING

A flared, hollow, printed circuit terminal permits dip soldering or wrapping wire around the terminal.

The No. 2755 terminal is brass per QQ-B-626a, Comp. 22, 1/2 hard and finished with copper flash and .0003" tin-lead plate 60-40%. It can be inserted in panel thicknesses varying from 1/16" to 5/32" and is 1/8" long when mounted. Terminal mounts in a .062" od hole.

Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass.

Use postpaid card. Circle No. 64

PACKAGING SERVICE FOR FASTENERS & SMALL PARTS



An electronic packaging service provides heat-sealed packets of screws and small parts at 10% of the cost of hand packing.

Electro-Pak turns out imprinted packets filled with automatically-counted parts at the rate of 6,000 packets per hour. Up to three different types of small parts can be included in a packet.

Packets are 4 1/2" wide and can be any length from 2 to 6".

Abbott Screw & Manufacturing Co., 6525 N. Clark St., Chicago 26, Ill.

Use postpaid card. Circle No. 65

CRYOGENIC VALVES HAVE LOW LEAKAGE



Hardened seats for longer life are featured in miniature cryogenic valves designed for the missile industry. The valves range from 100 psi to 4000 psi in capacity, and operate dependably in a temperature range from minus 425°F to plus 300°F.

Functional tests using 1000 actuations at various temperatures showed zero leakage in the 70°F range and leakage as low as .5cc at minus 300°F at 3000 psi.

Hydraulic Research and Manufacturing Co., 2835 N. Naomi, Burbank, Calif.

Use postpaid card. Circle No. 66

TEFLON TAPE WITHSTANDS TEMPERATURES UP TO 350°F

A cast teflon film with a pressure sensitive backing permits continuous usage up to temperatures of 350°F, and short time application up to 400°F.

Type "IT" consists of a laminate of type S teflon film bonded to a high-tack adhesive layer. Since the tape is not chemically etched, the electrical, chemical and mechanical characteristics of teflon are fully maintained.

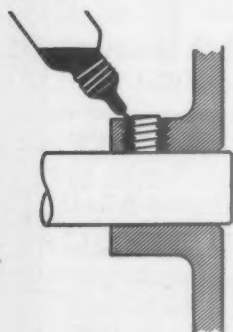
Dilectrix Corporation, Allen Blvd. & Grand Ave., Farmingdale, L.I., N.Y.

Use postpaid card. Circle No. 67

SCREW DRILLS AND TAPS OWN HOLE



A self drilling tapping screw drills its own hole and pulls itself into secure position with a small amount of torque



**One drop
of Loctite
and a
set screw
stays put!**

Loctite Sealant, "the Liquid Lock Washer," wicks between threaded surfaces... then hardens in the joint. Locking action extends over entire engaged area. Result: an end to costly breakdowns caused by vibration-loosened screws. Parts treated with Loctite are removed easily with ordinary tools.

Call your distributor, or write us for literature and free sample.

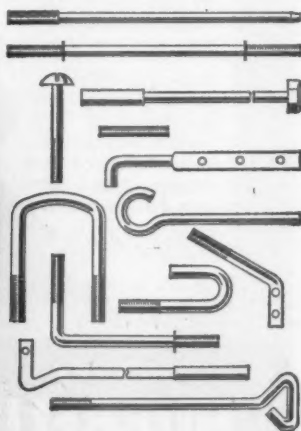
LOCTITE[®] SEALANT
AMERICAN SEALANTS COMPANY

• 135 N. MOUNTAIN RD. • HARTFORD 11, CONN. •

Use postpaid card. Circle No. 252

Complete Facilities for the
manufacture of **Special Headed and Threaded**
fasteners / from 1" to 60" in length in
short or long runs

U-BOLTS
SPADE BOLTS
THRU BOLTS
HOOK BOLTS
COLLARED RODS
CHAIN and LADDER RODS
Specialists in...
KNURLING
THREADING
DRILLING
HEADING



Send drawings or blueprints for quotes and literature.

OHIO ROD PRODUCTS CO., INC.

20265 1st AVENUE • BEREA, OHIO

Use postpaid card. Circle No. 253

Assembly & Fastener Engineering

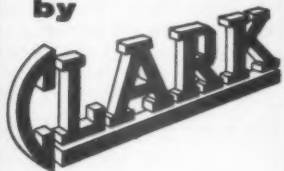
On this Simple
Slotted Head Screw
OUR CUSTOMER

SAVED
OVER \$20.00
per thousand pieces



with Redesign
for

COLD HEADING
by



THE PROBLEM:

Cost of this special slotted head screw, when machined from bar stock by our customer, was considered too high.

SPECIAL REQUIREMENTS:

Head must be tapered and slotted. Thread gage must go to within $1\frac{1}{2}$ threads of shoulder.

SOLUTION:

Production by Clark utilizing cold heading process.

SAVINGS TO CUSTOMER:

Over \$20.00 per 1,000 pieces.

Send sample or blueprint for prompt analysis and quotation ... at no obligation.

CLARK
BROS. BOLT CO.
MILDALE, CONN.

Use postpaid card. Circle No. 254

December, 1961

and forward pressure. It has positive rake cutting edges extending along the entire point, and produces more back out and strip out pressure.

Specially designed torque lugs under the head of the Rapidril protect against over-driving of the threads and provide additional locking action.

Sizes 6 to 10 diameters have the same standard $\frac{1}{4}$ " hex head to simplify tooling along production lines.

Central Screw Co., 3501 S. Shields Ave., Chicago 9, Ill.

Use postpaid card. Circle No. 66

INTERNAL INSERTION OF NYLON LOCKING PELLETS

Complete facilities for inserting nylon pellets into all types of nuts and female parts is announced.

The Nylok-Detroit process involves pelletizing equipment that inserts the pellet from the inside, without breaking through the outer walls of the nut. Since the pellets are on the inside, external finishes on decorative nuts are not affected.

The Nylok-Detroit Corp., 1893 Barrett Rd., Troy, Mich.

Use postpaid card. Circle No. 60

FASTENER WITH SQUARE POINT IS EASIER STARTING

A newly developed square-pointed fastener starts easier and drives straighter.

The Type "S" is available in all standard sizes, finishes and head styles. It uses the same lead holes as most standard thread-cutting and thread-forming screws.

National Lock Co., 1902 Seventh St., Rockford, Ill.

Use postpaid card. Circle No. 70

SELF-ALIGNING FITTINGS ABSORB SHOCK, VIBRATION

Standard, self-aligning swivel fittings permit the use of rigid metal tubing in aircraft and missile engines for greater fluid system reliability.

The Dumont self-aligning fittings will absorb vibration, shock and thermal expansion in rigid metal tubing and provide the needed flexibility. It also reduces the possibility of flare breakage or loosening of connector nuts.

Each fitting is capable of rotating a full 360° and has a movable nose which will compensate for misalignment up to 14°.

Dumont Engineering Co., 1401 Freeman Ave., Long Beach, Calif.

Use postpaid card. Circle No. 71

for immediate delivery

12 POINT EXTERNAL BOLTS
WRENCHING
certified aircraft quality



Mercury 12 point external wrenching bolts, manufactured from high tensile steel and high temperature, heat resistant materials, to meet exacting customer requirements. High temperature ... MS 9023 thru MS 9029; High tensile steel ... MS 9088 thru MS 9152. Exotic materials available.

Write for Catalog 286. AN—N.A.S.—M.S. and 6-digit hardware. Immediate delivery of standard sizes

Mercury air parts co., inc.

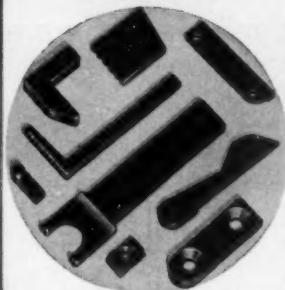
9310 West Jefferson Blvd., Culver City, Calif. Telephone—UPTON 9-5923—Teletype—CVR CY 4138

MANUFACTURERS OF AIRCRAFT HARDWARE

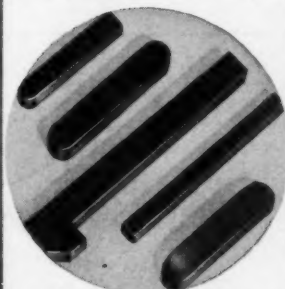
Use postpaid card. Circle No. 255

GILLEN

One Source for
KEYS AND
SPECIAL
PARTS



MACHINE PARTS



MACHINE KEYS



WOODRUFF KEYS

Gillen has the years of skill and experience in meeting the precise specifications of machine builders for keys and special parts of every type, size and shape.

Send prints for complete data & prices.



JOHN GILLEN COMPANY
subsidiary of
STANRAY CORPORATION
2550 South 50th Avenue
Cicero 50, Illinois

GILLEN

Use postpaid card. Circle No. 256

EVERY TYPE OF KEYING AND PINNING DEVICE FOR PRODUCTION ASSEMBLING

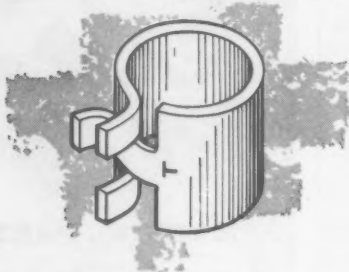
PIVOTS • BUSHES • TENSION, TAPER, GROOVE & DOWEL PINS • MACHINE KEYS & PARTS

INFORMATIVE NOTES TO IMPROVE YOUR PRODUCT ...SAVE YOU MONEY

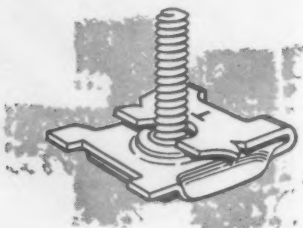
*Published as a service to
Designers and Engineers*

Ideas from Tinnerman have cut costs, improved products. Here are examples from Tinnerman's 10,000 variations of SPEED NUT brand fasteners—all stamped with the T-mark of total reliability.

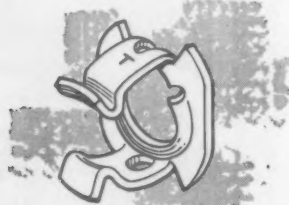
Tinnerman can help you cut costs with a free Fastening Analysis of your product. Call your Tinnerman representative, or write: *Tinnerman Products, Inc., Department 12, P. O. Box 6688, Cleveland 1, Ohio.*



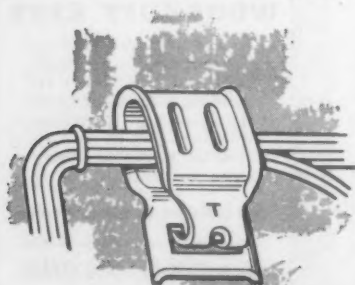
VERSATILE COMPRESSION RING has solved fastening problems in car radios, pressure gages, washers, and speaker cabinets. Simply squeeze compression fingers with pliers to expand... release, and spring tension maintains firm connection. Heat-treated spring steel of this SPEED CLIP® fastener won't lose tension, won't loosen under vibration. Possible applications are practically unlimited.



BOLT RETAINER used to fasten grille extensions to car fenders, has potential usage in any field where high-torque fastening is required on thin metal sections. This SPEED GRIP® fastener eliminates costly welding or staking, speeds assembly, allows savings in labor costs and parts handling. Barbs locate fasteners until nut is driven. One of Tinnerman's extensive line of SPEED GRIP nut and bolt retainers.



ELECTRONIC CONTROL CLIP retains tuning switch on chassis, gives constant spring tension for both push-pull and revolving controls... can be used wherever electronic controls are installed. This multipurpose SPEED CLIP fastener replaces threaded nuts, bushings, lockwashers. Cuts costs substantially. Live spring action lasts for the life of the equipment.



WIRE RETAINER is ideal for attaching single wire, light harness, cables or tubing. This SPEED CLIP fastener can be preassembled on the harness, allowing an entire wiring system to be snapped into place in seconds. Double embosses on upper clamping leg trap cold-flow tendencies of vinyl covered cord, assure 35 pound pull resistance. Clip will accept any wire or bundle up to .306" x .515".

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario.
GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S.A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Mecano Simmonds GMBH, Heidelberg.



Use postpaid card. Circle No. 257

Assembly & Fastener Engineering

USEFUL LITERATURE

To receive your copy of any literature reviewed here, use the postpaid card opposite page 54.

JOINING ALLOYS MANUAL

A sixty-page application manual gives more than 1,000 uses for company's specialty alloys for all types of welding, brazing and soldering of conventional metals. Bronze, copper, stainless steel, cast iron, magnesium and aluminum joining are among the numerous applications listed. Specific applications such as "brazing cam shafts" or "welding tubular aluminum bus seats" are listed opposite the proper alloy selection, whether it is an electrode, brazing rod, solder or solder alloys for high speed inert-arc welding. A concise directory of specialty products appears on the inside back cover. All-State Welding Alloys Co., Inc., 249 Ferris Ave., White Plains, New York.

Use postpaid card. Circle No. 91

NON-DESTRUCTIVE TESTING

The Type EC Permascope for non-destructive testing of non-conductive coating on a non-ferrous base metal such as aluminum or copper, and other non-ferrous metal testing is described in brochure. As well as containing descriptive information, specifications and prices, the brochure includes details of other equipment for the gaging of coatings on iron and steel and a technical discussion of non-destructive thickness testing. Twin City Testing Corp., 533 S. Niagara St., Tonawanda, N.Y.

New York.

Use postpaid card. Circle No. 92

ELECTRO-MAGNETIC DEVICES

New handbook is designed to assist the engineer in selection and application of electro-magnetic clutches and brakes, mechanical clutches, torque indicators, torque standards and multi-speed transmissions. It also acquaints him with the custom designed units and how they are used. Handbook No. 361 is available from Autotronics Inc., Dept. 30, Florissant, Mo.

Use postpaid card. Circle No. 93

CIRCUIT BREADBOARDS

A breadboard which permits wide latitude in the design of prototype circuits is described in six-page folder, No. 903. Also described is a complete system, showing how designed circuits can be easily followed for layout, component assembly, testing and final assembly. Circuit Structures Lab., P.O. Box 36, Laguna Beach, Calif.

Use postpaid card. Circle No. 94

CLIP TYPE FASTENERS

Clip type, multiple function and one piece fasteners are described in 32-page book No. 359. Included also are drawings of actual applications and engineering data. A generous selection of popular sizes, each clearly defined in a dimensional chart, provides complete technical information for company's fasteners. Tinnerman Products Inc., Dept. 14, P.O. Box 6688, Cleveland 1, Ohio.

Use postpaid card. Circle No. 95

SOLDERING IRONS

A complete line of soldering irons specifically designed for production-line soldering in the electronic, instrument and communication industries is listed in bulletin GEC 1545A. Also included is information on the Penline-120 iron. General Electric Co., Schenectady 5, N.Y.

Use postpaid card. Circle No. 96

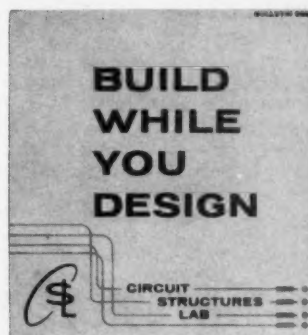
EYELET MANUFACTURING

Information booklet gives complete information on manufacture and engineering services available from eyelet manufacturer. Cly-Del Manufacturing Co., Sharon Rd., Waterbury 20, Conn.

Use postpaid card. Circle No. 97

CONSTANT FORCE SPRINGS

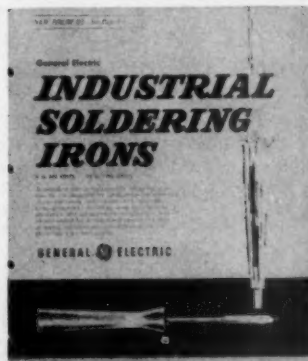
Comprehensive and detailed design information on constant force extension springs is covered in a series of related



See No. 94



See No. 95



See No. 96

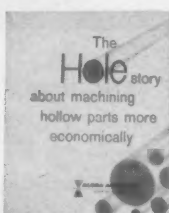
data sheets. Included is a step-by-step procedure for designing the springs along with 14 design tables. The sheets of the design data package are punched for loose leaf binding. Hunter Spring Co., Div. of American Machine & Metals, Inc., Lansdale, Pa.

Use postpaid card. Circle No. 98

HYDRAULIC PLUGS

The uses of a tapered plug to seal cross holes in hydraulic components are described in 18-page booklet. Also included are tables showing stock plug items, design information and specifications. The Lee Company, Westbrook, Connecticut.

Use postpaid card. Circle No. 99



SCREW MACHINE STOCK

Bulletin details material costs savings of from 10% to 26% with the use of hollow screw machine stock and mechanical tube. Tabular data outlining machinability and corrosion resistance ratings, mechanical properties and specifications of the various alloys, and

the range of sizes and alloys offered are also included in the 12-page bulletin. Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

Use postpaid card. Circle No. 100

STANDARDIZED CONVEYORS

How users may create custom conveyors from standardized components is described in bulletin 200B. Photographically described are end sections, convex curved sections, straight sections, concave curved sections and take-up charge sections. May-Fran Manufacturing Co., 1710 Clarkstone Rd., Cleveland 12, Ohio.

Use postpaid card. Circle No. 101

ELECTRONIC WELDING HEAD

Precision welding head built for production use is described in information sheet. Full specification data plus application of the VTA-42 welding head is also given. Hughes Aircraft Co., Vacuum Tube Products Div., 2020 Short St., Oceanside, Calif.

Use postpaid card. Circle No. 102

TERMINALS AND SPLICES

Catalog enables users to compute precisely what terminal or splice barrel size must be used to accept any given size of solid, stranded, rectangular or square wire, singly or in combination, from No. 26 to 1,000,000 cm. Charts are included which define the computations necessary to determine circular mil area of square or rectangular wire,

round solid wire AWG and stranded wire AWG. Another chart shows how to choose oval-shaped terminal barrels for some combinations of wire, or in cases of unusually wide and thin rectangular wire. AMP Incorporated, Eisenhower Blvd., Harrisburg, Pa.

Use postpaid card. Circle No. 103

LIGHTING DATA

Bulletin GET-3100 describes in 16-pages the basic functions of luminaires, with photometric data and sample problems for area lighting applications. Tables of lamp data are also included. General Electric Co., Schenectady 5, New York.

Use postpaid card. Circle No. 104



COMPRESSION TUBE FITTINGS

Tube fittings featuring a reversible ferrule are illustrated and described in 20-page catalog 4323. Included also are engineering dimensions. Parker Fittings & Hose Div., Parker-Hannifin Corp., 17325 Euclid Ave., Cleveland 12, Ohio.

Use postpaid card. Circle No. 105

MINIATURE HEADLESS SLOTTED SET SCREWS

... put your needs in MOORE'S capable hands



Wherever you require precision miniature headless slotted set screws, you can depend on Moore to meet your requirements to complete satisfaction. Prices are right. Delivery is fast. And quality is to the highest industry standards. Available in sizes #0 through #4 in a wide selection of materials, finishes, lengths and points.

Specify Moore and be sure. Dependable quality for over 80 years. Write for price catalog.

MOORE
SET SCREWS

George W. Moore, Inc.
since 1880
91 Beaver St., Waltham 54, Mass.

Use postpaid card. Circle No. 259

TELEGUIDE...by LaBelle

AUTOMATICALLY TELLS WHAT TO DO AND SHOWS HOW TO DO IT. PROVIDES GUIDANCE THROUGH INTRICATE, LENGTHY, OR "PROBLEM" ASSEMBLIES. ASSURES SMOOTH PRODUCTION FLOW WITH A SIGNIFICANT REDUCTION OF REJECTS.



Let us show you how LaBelle Teleguide and your personnel become a production team unequalled. A new brochure explains it, but a demonstration to management proves it. Why not call now? Telephone Oconomowoc, Wisconsin, LOgan 7-5527.

ORIGINAL MANUFACTURERS OF SYNCHRONIZED SLIDE-SOUND EQUIPMENT FOR
LA BELLE INDUSTRIES, INC.
504 SOUTH WORTHINGTON STREET • OCONOMOWOC, WIS.
TRAINING, SELLING, PROMOTION, PUBLIC RELATIONS AND PRODUCTION LINE GUIDANCE

Use postpaid card. Circle No. 260

Assembly & Fastener Engineering

GLOSSARY OF WIRE TERMS

A glossary of wire terms are included in 72-page catalog. Also included are charts and tables covering flat and shaped wires, low carbon coarse wire, high carbon and specialty wire. Colorado Fuel & Iron Corp., Wickwire Spencer Steel Div., P.O. Box 551, Palmer, Mass.

Use postpaid card. Circle No. 106



NYLON STOCK SHAPES

Range of available nylon stock shapes, sizes and properties, including types "6" and "101", is given in eight-page booklet. Data on moisture conditioning, machining, bonding and welding and coloring of nylon parts is also given. Cadillac Plastics & Chemical Co., 15111 Second Ave., Detroit 3, Mich.

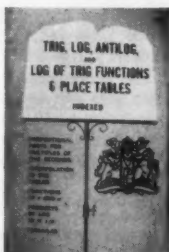
Use postpaid card. Circle No. 107

TRIG FUNCTION HANDBOOK

Trig, log, antilog, and log of trig functions 6 place tables are listed in compact 192-page vest pocket handbook. Included also are eight pages of formulas, eight pages of interpola-

tion and other pages of valuable information. The book is priced at \$1.00. Ottenheimer Publishers Inc., 4805 Nelson Ave., Baltimore 15, Md.

Use postpaid card. Circle No. 108



V-BAND COUPLING USE

How simplified fastening of V-band coupling can improve functional design and product appearance, decrease assembly time and cut manufacturing costs is covered in 8-page booklet WB-1. It also illustrates a few of the many available coupling and flange configurations, explains the sealing principle and shows typical V-band applications. Marman Division, Aeroquip Corp., 11214 Exposition Blvd., Los Angeles 64, Calif.

Use postpaid card. Circle No. 109

CORROSION RESISTANT STEEL

The role of molybdenum and copper in corrosion resistant steels and alloys is the subject of 60-page booklet. Containing numerous tables, charts, graphs

for every Heart
in your family

Give
HEART FUND

**"TORQUE WRENCH"
MANUAL**

SENT
UPON REQUEST

Formulas
Applications
Engineering Data
Screw Torque Data
Adapter Problems
General Principles

P.A. **STURTEVANT CO.**
ADDISON **QUALITY** ILLINOIS

Use postpaid card. Circle No. 282

Pin it
...with
Hindley
Cotter Pins

Precision cotter pins hold down assembly costs. For a full range of shapes and sizes in Monel, Inconel, Stainless Steel, Brass, Copper and other metals, call on Hindley. Write for folder.

Hindley
Since 1897

Hindley Manufacturing Co., Cumberland, R. I.
Wire Hardware - Cotter Pins - Pinning Specialists

Use postpaid card. Circle No. 281

and photographs, it describes in detail the rapid development of corrosion resistant steels based on the use of molybdenum, copper and nickel. Special emphasis is placed on the economic and technological benefits of selecting the proper alloy for specific performance required. Climax Molybdenum Co., 1270 Avenue of the Americas, New York 20, N.Y.

Use postpaid card. Circle No. 110

RESISTANCE SOLDERING

The ease with which relatively complicated or difficult work can be performed on production lines with a resistance soldering method is discussed in condensed catalog 105Q. Included also are photographs and descriptions of power supplies, handpieces and accessories. American Electrical Heater Co., Wassco Glo-Melt Div., 6110 Cass Ave., Detroit 2, Mich.

Use postpaid card. Circle No. 111

CARBON-GRAPHITE GUIDE

An illustrated engineering guide on carbon-graphite materials for mechanical applications tabulates 18 grades of carbon, graphite and carbon-graphite available for use in bearings, bushings, and seals. Bulletin S-5425 lists such properties as apparent density, hardness, compressive tensile, and flexural strength, elastic modulus, thermal conductivity and coefficient of thermal expansion. National Carbon Co., Div.

of Union Carbide Corp., 270 Park Ave., New York 17, N.Y.

Use postpaid card. Circle No. 112

ASSEMBLY CONVEYORS

The ready adaptability of conveyors and transfer chassis to any machine tool arrangement is illustrated in bulletin C-760. Also included are engineering drawings of carousel conveyors, over and under conveyors and application analysis data. Visi-Trol Engineering Co., 12720 Burt Rd., Detroit 23, Michigan.

Use postpaid card. Circle No. 113



SOLID LUBRICATION USE

The theory and use of solid lubricants are discussed in 8-page brochure No. 132. The brochure covers such barriers to effective lubrication as galling and seizing, high friction, temperature and extreme environments. Actual applications describe how solid lubricants have solved difficult lubrication problems. Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.

Use postpaid card. Circle No. 114

EXPLOSIVE CONNECTORS

Ordnance data sheet presents details on power cartridge connector. These explosive units are designed to actuate missile and space vehicle mechanisms such as separation systems, thrust termination systems and electrical disconnects. Included are physical characteristics, environmental capabilities, performance charts and an engineering drawing of the unit. Hi-Shear Corporation, 2600 W. 247th St., Torrance, Calif.

Use postpaid card. Circle No. 115

STATOR CUFF INSERTER

Operation of dual slot stator cuff inserter is given in information sheet No. 616-SC. Also included is a line diagram of the principal parts of the unit and engineering specifications. Possis Machine Corp., 825 Rhode Island Ave. S., Minneapolis 26, Minn.

Use postpaid card. Circle No. 116

PLASTIC APPLICATIONS

Pocket-sized six-page booklet compares properties and typical industrial applications of 13 major plastic families in common industrial use. Included are acrylic, implex, nylon, teflon, polyethylene, flexible and rigid vinyl, cellulose acetate, butyrate, polystyrene, high and medium impact styrene, phenolic and fibrous glass reinforced polyesters and epoxies. "Getting Acquainted with Plastics" is available from Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.

Use postpaid card. Circle No. 117

BE SURE ABOUT YOUR FASTENERS!

...use the right one... with the right holding power
...delivered right on time... at the right price

Speed up your assembly work, eliminate alignment problems, cut your production costs with McLaughlin pre-engineered nuts and bolts that give you positive holding action.

Complete stocks, close liaison, assure you of the quantities you need at the right time and the right price.

Specials—including aluminum and stainless—for every fastening application.

WRITE, WIRE OR PHONE TODAY FOR COMPLETE CATALOG OF STANDARD ITEMS-NUTS-BOLTS-STAMPINGS



ESTABLISHED 1946

212 JAKINS BLDG. JORDAN 5-3826 BIRMINGHAM, MICHIGAN

Use postpaid card. Circle No. 282



Don't blindfold him!

THE AWESOME-looking instrument in the picture above is an electron microscope. Through it, a cancer researcher can observe the detail of a cancer cell—magnified 100,000 times.

The microscope costs \$35,000 and was paid for by American Cancer Society funds—which support 1300 scientists, all working to find the cause of cancer, and its prevention.

Don't blindfold cancer research. Give to it. Send your contribution to CANCER, c/o your local post office.

AMERICAN CANCER SOCIETY



STANDARD AND SPECIAL TAPS

A tap catalog and tapping handbook illustrates and describes standard and special taps. In addition, the 24-page catalog includes a tap user's guide, trouble-shooting section, resharpening instructions and tables on thread constants as well as a glossary of terms. Besly-Welles Corp., South Beloit, Ill.

Use postpaid card. Circle No. 118



RIVET PRICES

A net price catalog replaces the standard list price catalog and discount sheet which required several steps in calculations by the buyer in computing the price of a rivet. Time saving and elimination of possible errors are the result. Tubular Rivet & Stud Co., Quincy 70, Mass.

Use postpaid card. Circle No. 119

MINIATURE GEARS

Catalog gives description and specifications for line of miniature precision gears and gear blanks. Also included is a simple formula for pricing of each type of gear, from extra fine pitches, up to AGMA precision Class

3 gears. Northfield Precision Instrument Corp., 4400 Austin Blvd., Island Park, Long Island, N.Y.

Use postpaid card. Circle No. 120

MAGNETIC CONTROL BOARDS

How steel boards and magnet backed card holders can be used for a variety of visual controls such as job scheduling, assembly line production, personnel control and sales is described in 12-page bulletin. Included also is a catalog and prices of the boards and accessories. Methods Research Corp., 105 Willow Ave., Staten Island 5, N.Y.

Use postpaid card. Circle No. 121

THERMOCOUPLE WIRE

Weight tables for commonly used sizes of noble metal thermocouple wire are listed in a data sheet. Detailing weights per foot in ounces and grams for thermocouple wire from .008" to .045" in diameter, thermoelements listed are for various grades of platinum, platinum-rhodium, iridium-rhodium, irridium and platinel. Technical Service Dept., Engelhard Industries, Inc., 75 Austin St., Newark 2, N.J.

Use postpaid card. Circle No. 122

HIGH ALUMINUM CERAMIC

Ceramic-to-metal housings for high power, high current semiconductor rectifiers are described in engineering sheet AV-100. It includes a photo showing typical rectifier housings, as well as a line drawing showing con-

struction details. Electrical and mechanical properties of the high aluminum ceramic used are also listed. Advanced Vacuum Products Inc., 430 Fairfield Ave., Stamford, Conn.

Use postpaid card. Circle No. 123

LIQUID SEALANTS

Eight-page booklet describes method of application and selection of proper grade of liquid sealant for specific uses. Also included are case histories, showing the variety of uses for the sealant. American Sealants Co., 705 N. Mountain Rd., Hartford 11, Conn.

Use postpaid card. Circle No. 124



SELF-SEALING FASTENERS

Four types of self-sealing fasteners, two of which are available with Nylok thread inserts are illustrated and described in four-page bulletin, H-61. By means of charts, diagrams and descriptive text, full information on the four types is provided. A. P. M. Corporation, 41 Honeck St., Englewood, N.J.

Use postpaid card. Circle No. 125

PROGRESSIVE makes BIG fixtures

For many years Progressive has pointed the way to better production in American industry with new ideas in welding equipment and fixtures.

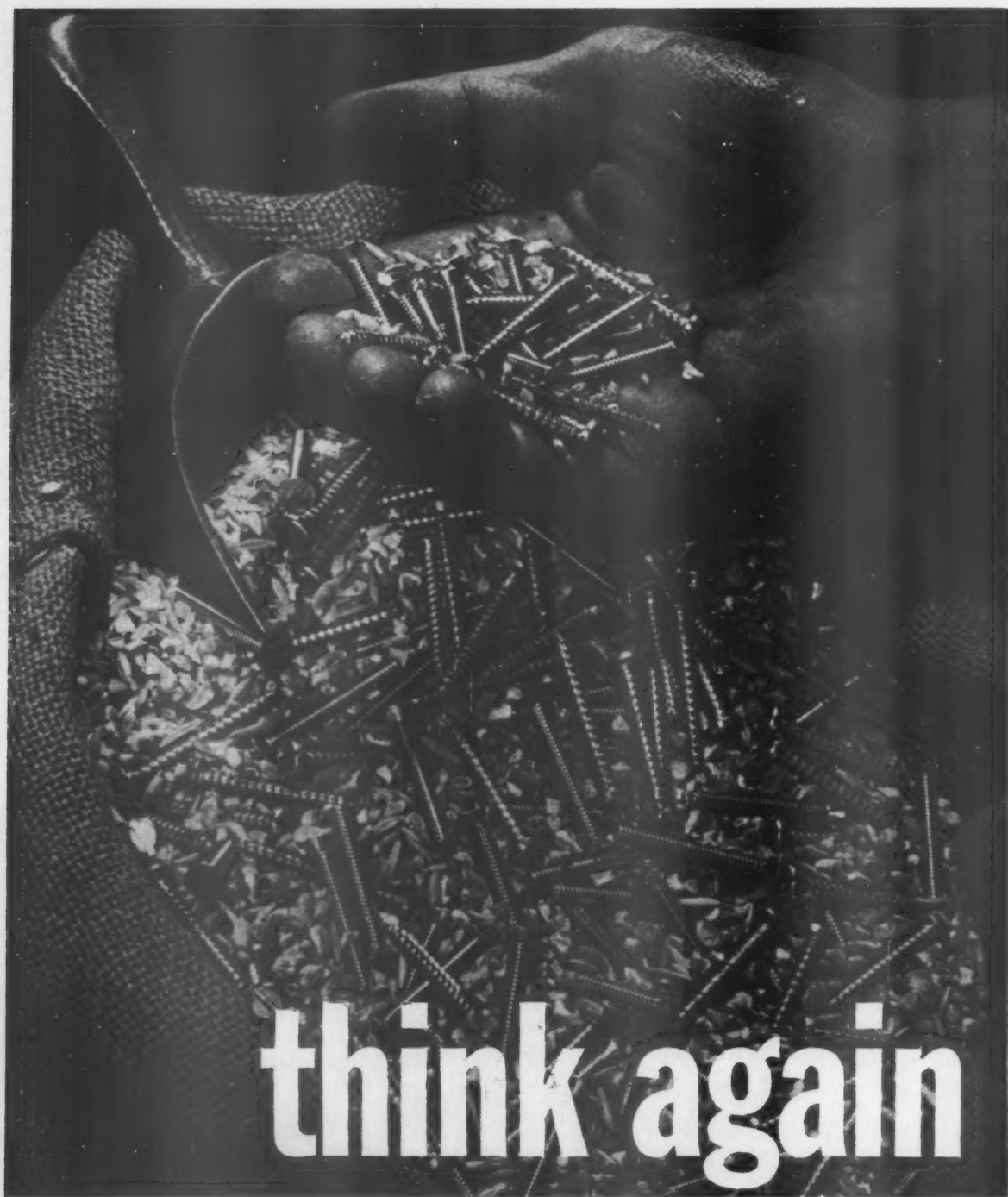
Today Progressive's modern facilities and extensive experience offer dependable solutions to the many unusual problems confronting industry the world over.

This gigantic (24' diameter x 70' length) booster assembly fixture for the Saturn missile, shown above, is a good example of Progressive's tremendous facilities and abilities.

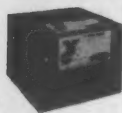
Progressive's experience can save you time and money. Our engineers will gladly discuss your requirements.

THE PROGRESSIVE WELDER & MACHINE CO. 915 Oakland, Pontiac, Mich.

Use postpaid card. Circle No. 263



think again



If you think that fasteners are "chicken feed", think again. Your costs mount up when you use faulty fasteners that slow down and stop assembly operations, or cause damage to materials and tools.

Why not buy quality fasteners in the first place, and then your fastener costs will really be "chicken feed".

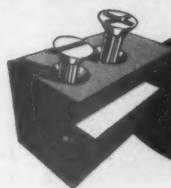
Order Southern Screws from your distributor, or write direct to Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.

Over 1,500,000,000 pieces in stock at factory and main warehouse in Statesville, N. C.

Warehouses: New York • Chicago • Dallas • Los Angeles

Types A, B, C, & BP Tapping Screws* • Types 1, 23, 25, F, & BF Thread Cutting Screws* • Machine Screws* and Nuts • Wood Screws • Stove Bolts • Roll Thread Carriage Bolts • Hanger Bolts • Dowel Screws • Wood & Type U Drive Screws • Continuous Threaded Studs • Speaker Screws • Lag Screws • Slotted & Phillips

Use postpaid card. Circle No. 264

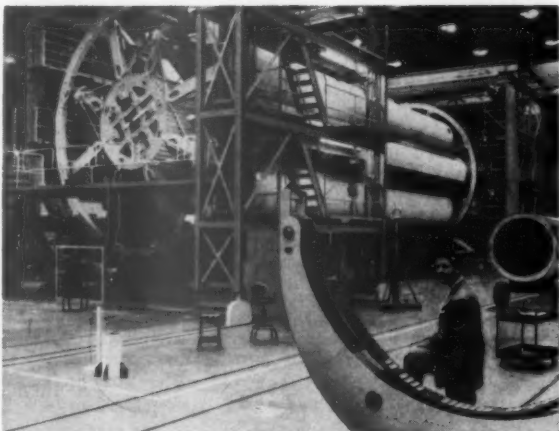


Southern
SCREW COMPANY
STATESVILLE • NORTH CAROLINA

INDUSTRY MAKES NEWS



New salesmen learn air tools from theory through the finished product. George Walker, (c) discusses unit with school's first group of students, left to right, Dudley Gang, Hugh West, Richard Spott, Charles McClanahan, Frank O'Niel and Ira Wilkinson.



Fixture used in the fabrication and assembly of the cluster of nine fuel tanks which supply the booster propulsion system of the C-1 Saturn missile.

SEPTEMBER FASTENER SHIPMENTS

The Industrial Fastener Institute reported the seasonally adjusted index of fastener shipments for September, 1961 was 95% of the 1956-58 average.

The September shipments were at the same level as August, and both months recorded the highest activity since September of last year.

CLECO OPENS TECHNICAL TRAINING SCHOOL

To keep pace with its accelerated product development program, Cleco Air Tools, a division of Reed Roller Bit Co., has recently established a two-week sales and technical training school for its sales representatives.

The two week program is set up in four phases, and includes a study of the theory of air motors, fundamentals of air tool design, specific designs of the company's air tools and sales techniques.

The sessions are held in the company's plant in Houston, and are under the direction of George Walker, Cleco service manager.

PROGRESSIVE WELDER AIDS SATURN ASSY.

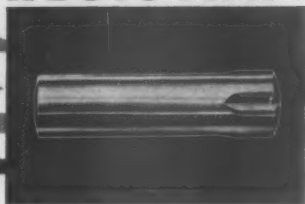
Working for the past four years in conjunction with the Army Ballistic Missile Agency and the National Aeronautics and Space Administration, Progressive Welder and Machine Co. played a major part in the construction of the first stage of the Saturn C-1 rocket which was successfully launched on October 27th.

The company constructed the gigantic fixtures used in the fabrication and assembly of the cluster of nine fuel tanks which supply the booster propulsion system of the space vehicle. In spite of the large size, tolerances were held to plus or minus five thousandths of an inch.

Construction of the fixtures took place in the company's Pontiac, Mich. plant, with final installation being at the Huntsville, Ala. laboratories of the NASA Marshall Space Flight Center.

The Saturn is the largest space vehicle ever built in the U.S. It is higher than a 15-story building. It will develop 1.5 million lbs. of thrust and is designed to carry the Apollo spacecraft in which astronauts will orbit the earth.

need **CORROSION RESISTANT** fasteners?



Regardless of cost, the best fastening devices aren't worth a cent if corrosion shortens their useful lives. Driv-Lok grooved pins can be produced in a variety of metals and finishes designed to give you a positive lock, lasting through harmful effects of moisture, acids, alkalies, oils, solvents and other chemicals.

From its raw material inventory of carbon and alloy steels, stainless, silicon bronze, brass and aluminum, Driv-Lok can fill your need for corrosion-resistant pins in extremely short order.

Finishes? Standard is zinc electro plate. Heavier deposits, dichromate dips, and other finishes such as brass, nickel, cadmium and black oxide, are immediately available.

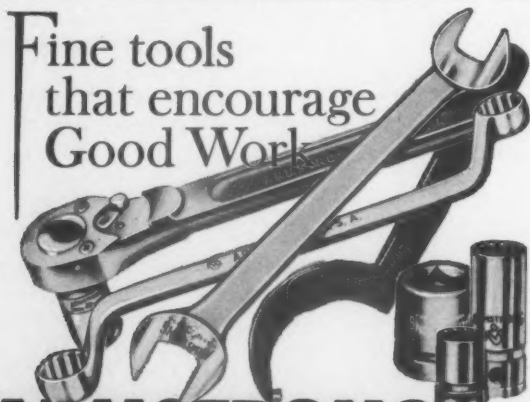
Let us show you how effective, versatile and corrosion-resistant, **DRIV-LOK** grooved pins can be. Send for your free catalog or give us a call, Sycamore 2148.



DRIV-LOK SALES CORPORATION

731 Park Avenue, Sycamore 5, Illinois

Use postpaid card. Circle No. 265



ARMSTRONG WRENCHES

An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALLOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN

(carbon steel) Wrenches in baked-on gray enamel with heads ground bright... all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant... 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls... each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

ARMSTRONG BROS. TOOL CO. 5203 W. ARMSTRONG AVE. - CHICAGO 46, U.S.A.



Use postpaid card. Circle No. 266

MANAGEMENT CHANGES AT PARKER-KALON



MORLEY



BATTAGLIERO



OEST

A reorganization of plant management has been announced by Parker-Kalon, Division of General American Transportation Corp.

R. H. Morley was appointed general manager in charge of manufacturing. He had been assistant to the president of the company since 1960.

Alfred Battagliero, who was former chief engineer, has been named production manager. He will supervise the service departments, and manage tapping and socket screw production.

Louis Oest has been named chief standards engineer having formerly served as standards engineer. His responsibility will entail special emphasis on maintaining and improving quality control and inspection methods.

ASSISTANT RES. DIRECTOR AT SELAS

W. Roderic Bliss has been named assistant director of research for the Selas Corp. of America. He comes to Selas from the Martin Co., where he held the position of manager, industrial development, on the corporate planning staff. Previously he was manager of the firm's electronics technical staff in Colorado.

SYMPOSIUM ON METAL JOINING DEC. 11-13

The Pennsylvania State University will conduct a Metal Joining Symposium from December 11 to December 13. Under the chairmanship of Dr. Karl M. Weigert, Assistant Professor, Industrial Engineering at Penn State, the meetings will deal primarily with the fields of soldering, brazing and welding procedures and materials. Various filler metals and their physical properties will be reviewed and design features discussed for optimizing joint performance.

ELASTIC STOP NUT NAMES PRODUCT ENGR.

Richard Baubles was promoted to assistant chief product engineer for Elastic Stop Nut Corp. of America. He joined the company as a project engineer in 1955.

POLK RECEIVES STANDARDS ASSN. AWARD

Louis Polk, board chairman of The Sheffield Corp., was awarded the American Standard Association Howard Coonley Medal for 1961.

The award is in recognition of Polk's almost three decades of leadership in establishing high standards for dimensional quality control and for "the service he has rendered to the advancement of standardization and the understanding of its significant role in the American economy."

MANUFACTURING MGR. AT WILTON TOOL

Albert J. Furman has been appointed manager of manufacturing for the Wilton Tool Manufacturing Co. He most recently held the position of chief industrial engineer and director of industrial relations for the Englander Co.

DISTRIBUTORS FOR SYNPLEX PRODUCTS

The Synflex Products Division of Samuel Moore & Co. has announced the following distributors for its complete line of nylon industrial hoses and polyethylene, vinyl and nylon tubing:

Baker-Bohner Rubber Co., Louisville, Ky.
 Manufacturers Rubber & Supply Co., Memphis Tenn.
 Baldwin Belting Inc., New York, N.Y.
 Richmond Rubber Co., Richmond, Va.

HANDY & HARMAN MOVES TO NEW OFFICES

Handy & Harman, fabricators and refiners of precious metals has relocated its New York plant from 82 Fulton St., to 525 Nuber Ave., Mount Vernon, N.Y.

MERCHANDISING MGR. FOR BOWMAN PROD.

John F. Robinson has been named to the newly created post of merchandising manager for The Bowman Products Co. This new function is designed to give increased sales service to customers and the company's sales force of nearly 400 field representatives. Additionally, Robinson will be responsible for the direction of the company's advertising and public relations program.

REPRESENTS ROTOR TOOL IN CANADA

George Fewtrell has been named service engineer in the Montreal territory for Rotor Tool Co., Ltd., Ontario, Canada. He has been associated with several companies in the air tool industry during the past 14 years in Canada. Fewtrell will have his headquarters in Montreal.

ELECTED PRESIDENT SERVICE TOOLS INST.

Marvin S. Bandoli, senior vice president Pendleton Tool Industries, Inc., was elected president of the Service Tools Institute. The Institute is a national trade association representing U. S. manufacturers of pliers, wrenches, hammers and related mechanics hand tools.

R. D. Sulentic, president of the Waterloo Valve Spring Compressor Co., was elected vice president of the Institute. Elected to the executive committee were Bruce Foxhall,



On the left, a conventional metallic fastener. On the right, a Nylogrip nylon fastener. The big difference: Nylogrip is an excellent insulator, eliminates need for collars and washers. Nylogrip is corrosion and chemical resistant. Nylogrip is self-locking, eliminates need for locking devices. Nylogrip is more than 50% lighter, yet has tensile strengths up to 15,700 p.s.i. Nylogrip is available in a full range of colors. Nylogrip is highly heat resistant — form stable up to 450° F, withstands up to 300° F continuous heat with special nylons. Best of all: Nylogrip has largest available stock of non-metallic fasteners. Economical small lot prices, fast delivery. Specials engineered to your requirements. **WRITE FOR DETAILS.**

NYLOGRIP NYLON FASTENERS —
 Stocked in most head styles; diameters:
 #2 through 1/2"; lengths 1/8" through 2";
 hex nuts, flat washers, set screws —
 threaded rod — lock nuts — nylon balls —
 PVC fasteners — Nylogrip Dubo
 Lockwashers.

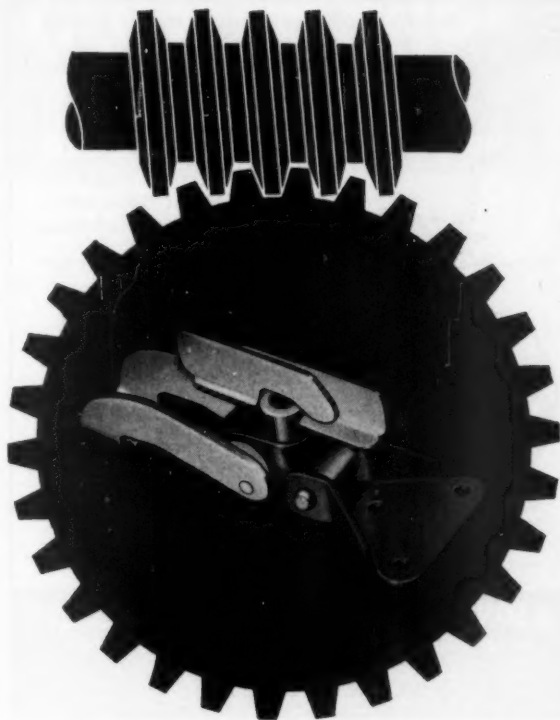


**NYLOGRIP
 PRODUCTS**

566 Pleasant Street,
 Watertown 72, Mass.

Use postpaid card. Circle No. 268

Exclusive from Bassick:



The clamp with "worm-gear advantage"

The tremendous mechanical advantage of the time-tested worm-gear mechanism is at your disposal in Bassick's "Gear Lock" clamp series... the only clamp of its kind manufactured.

Each Gear-Lock clamp can sustain a force of up to 2000 pounds—twenty times greater than the best resilient clamp. Gear-Locks are designed especially for air-tight, pressure-tight, or de-humidified containers of steel, aluminum, plastic or other materials. They're secure against shock and vibration, and can be fixed in a literally infinite number of closing positions, eliminating the necessity for "custom mounting" each clamp.

Gear-Lock clamps are just one of the extensive assortment of clamps, fasteners, strikes, springs, and levers manufactured by Bassick for both military and general industrial use. You'll find the complete line, plus a variety of typical applications, described and illustrated in Bassick Catalog No. CF-60.

Write for your copy today. **THE BASSICK COMPANY, Bridgeport 5, Conn.**
 In Canada: Belleville, Ont.



See our catalog in Sweet's Product Design File



Use postpaid card. Circle No. 269

Cut Labor and Equipment Costs with MAGNETIC HANDLING

Handle with Ease - Release with a squeeze

3 WAY RELEASING HAND MAGNET

Permanent magnet - no wires
no batteries - lifetime guarantee

for: Small Parts Handling
Sheet Metal Separation
Large Parts Handling



MAGNET CARRIER SPEEDS PARTS HANDLING



Workers simply place parts on these carriers. No attaching, hooking or positioning required. Parts are held securely by magnetic attraction as they proceed from one assembly point to another. Carriers also used for cleaning, rinsing, painting, drying and plating operations.

Write today for literature on Alnico & Rubber Magnets, Tool Holders, Magnetic Bases, Sheet Metal Separators and Feeders, Rotary Floor and Tank Sweepers, Coolant & Tramp Iron Magnets, Magnetic Lifters and Retrievers.

MAGNETIC PRODUCTS DIV. JESS CORPORATION

15770 Telegraph Road, Detroit 39, Michigan, KE 4-8616

Designers and Builders of Standard
& Custom Magnetic Equipment

Use postpaid card. Circle No. 270

NEW HEAVY DUTY JAW Controlled (Torque) Drive STUD DRIVER

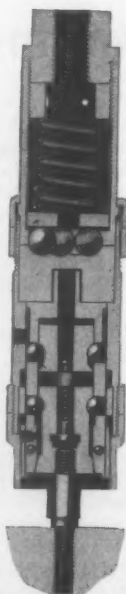
... brings the ultimate within reach for users
of self-opening stud drivers

A necessity where a limited amount of torque is
desired—as in driving shoulder studs.

As shown in the sectional view, this new tool has
an adjustable over-running clutch so that the
stud can be driven to any predetermined torque.
Simple adjustment is made by removing the two
Allen screws in the spring adjusting nut (di-
rectly above spring) and moving it downward for
increased torque, or upward for decreased torque.
It is not necessary to stop rotation at any time
while driving studs. Other outstanding Titan Stud
Driver features are: an automatic take-up for jaw
wear; an inexpensive method of changing the
cam ring; a new Heavy Duty Jaw which is inter-
changeable with all tools sold in the past two
years and can be used on any older Titan 100 Series
Stud Driver by purchasing a new style inner body
assembly.

While not designed for use with impact wrenches,
it is an ideal tool for use with any air or electric
drill or drill press at constant speed. Available in
sizes No. 101, No. 102 and No. 103.

Write for details and prices



World's Largest Producers Of
Stud Drivers And Pullers

TITAN TOOL CO.

47 MAIN ST., FAIRVIEW (ERIE COUNTY), PA.

Use postpaid card. Circle No. 271

The Utica Drop Forge & Tool Co., Norman Ellison, Moore
Drop Forging Co., Harry Silverstein, The Vaco Products
Co. and C. William Schlosser of Lectrolite Corp.

CHANGES IN OMARK MANAGEMENT



BOGUE



O'HERRON



LEWIS

Three management-level appointments have been an-
nounced by Omark Industries, Inc. David C. Bogue has been
named merchandising manager. Prior to his present appoint-
ment he was manager of the company's New York branch.

Paul J. O'Herron was promoted to field sales manager
for all the company's products. He was formerly assistant
to the sales manager in the home office.

Richard B. Lewis is now chief engineer for U. S. operations
of the company. Lewis was chief engineer of the Omark
factory in Canada prior to his present appointment.

ADVERTISING MGR. FOR AM. STEEL & WIRE

Richard F. Dorrel has been named advertising manager
for American Steel and Wire Division of U. S. Steel Corp.
He succeeds Richard Kimmel, who has resigned.

ALBANY PRODUCTS NAMES ASST. VP

Albany Products Company, Inc., announced the appoint-
ment of James Norris as assistant vice president. In his
new capacity, Norris will be in complete charge of inside
sales for the entire company, including all mail and telephone
sales, estimate, and servicing.

LONG-LOK NAMES LICENSING DIRECTOR

John H. Symons has been named director of licensing for
the Long-Lok Corporation. Previously in the sales depart-
ment, he will now conduct all negotiations with prospective
licensees, both domestic and foreign, as well as coordinating
all activities with present licensees.

NAMED MANAGER AT ATLAS BOLT & SCREW

Charles H. Carrick has been named manager-construction
products for Atlas Bolt and Screw Co. He was former
regional manager for Olin Mathieson Chemical Corp., and
has spent twelve years in the specialty fastener business.

KAYNAR NAMES TECH SERVICE ENGR.

Herbert J. Weston has been appointed technical service
engineer for the Kaylock Division, Kaynar Mfg. Co., Inc.

Before joining Kaynar, Weston was engineer in charge
of the propellant feed system of the new million-and-a-half
pound thrust F-1 rocket engine built by the Rocketdyne
Division of North American Aviation, Inc. at Canoga Park,
California. His previous industrial experience was with the
civil engineering department of the Colorado Fuel and Iron
Corporation.

A. P. M. CORP. OCCUPIES NEW PLANT

The A.P.M. Corp. manufacturers of high-pressure sealing
devices, has transferred all operations to its new plant at
41 Honeck Street, Englewood, New Jersey.

Designed specifically to suit the needs of their manu-

Assembly & Fastener Engineering

facturing and molding operations, the single-story structure provides spacious factory and office space—including separate areas for engineering activity, design and development laboratory, test lab, and complete machine shop. work in Alaska.

MIDWEST REPS. FOR MILFORD RIVET



BARTH

William L. Barth, Jr. of Chicago, Smith-Moschner & Co., St. Louis, Nelson & Son, Minneapolis and Kenneth L. Ekdahl Co. of Moline have been named sales representatives in midwestern states by the Milford Rivet & Machine Co.

David Ingalls, formerly sales engineer with Milford Rivet, has joined the Barth organization as sales engineer. Russel Ritchel of the company's Aurora plant will also be available for machine and tool service in the Barth territory.

The Barth and Nelson appointments were effective Nov. 1. The other two will become effective December 14.

FIELD SALES MGR. FOR CRAMER DIVISION

Manuel R. Ramos has been appointed field sales manager for the Cramer Division of Giannini Controls Corp. He was formerly the district manager of the division's New York sales office.

GULTON CONTRIBUTES TO U.S. EXHIBIT

Samples of ultrasonic manufacturing equipment made in the United States have been contributed by Gulton Industries to the U. S. Exhibition at the 30th International Trade Fair at Poznan, Poland.

The New Jersey electronics engineering and manufacturing company will display its new ten-watt ultrasonic welder.

The Poznan exhibition is managed by the Office of Inter-

MULTIPLE SPINDLE SCREWDRIVING MACHINES

A complete line of equipment for high production. Feed and drive screws in Multiples up to 10 screws at a time.

SINGLE SPINDLE SCREWDRIVING MACHINES

For assemblies that require the driving of one screw at a time.

NUT SETTING MACHINES

Mechanize Nut driving operations.

INSERTING EQUIPMENT

Feed and insert pins, rivets, etc., singly or in multiples.

PART FEEDERS

A complete line of feeding equipment. Various types and sizes to suit job requirements.

COMPONENTS

All above machines can be furnished adapted for incorporation into Automatic Assembly Machinery.

ASSEMBLY EQUIPMENT

Economical machines designed and built around standard Cook & Chick components to meet job requirements.



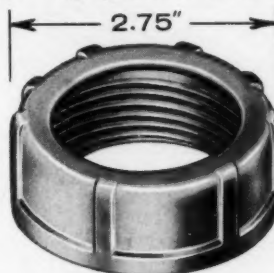
COOK & CHICK COMPANY

2415 West 24th Street Chicago 8, Illinois

Use postpaid card. Circle No. 272

COLD IMPACT EXTRUSIONS

High speed automatic equipment, designed and built by Jacobson, for cold impacting and secondary operations, has produced substantial economies in high production items.



Fitting—1010 Steel

Production Rate—100 Pieces per minute in a 1300 Ton Impacting Press.

• In steel, brass, aluminum and stainless steel.

JACOBSON NUT MFG. CORP.

Kenilworth, New Jersey

Use postpaid card. Circle No. 273



CONDUIT LOCKNUTS
— Up to 6"



WELD NUTS
Square & Hexagon



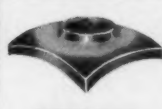
MACHINE SCREW &
FINISHED NUTS



STOP-NUTS



WING NUTS



SPRING-NUTS



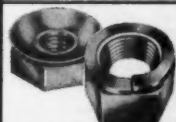
BARREL-PRONG
NUTS



LOCKNUTS
Reversible—One Piece



SWITCH
MOUNTING NUTS



WASHERED LOCKNUTS



LOCKNUTS
Deflected Top



IMPACT
EXTRUSIONS

Available in Stainless Steel, Brass, Aluminum and Steel
JACOBSON NUT MFG. CORP.
KENILWORTH, N. J.

Use postpaid card. Circle No. 274

IMPORTANT NEWS FOR SILVER BRAZING PREFORM USERS



NEW "CLOSE CLUSTER" DIE PROCESS CUTS BRAZING PREFORM WASTE, SAVES YOU MONEY!

Scrap means waste. And that adds to the cost of your silver brazing preforms. Precision dies arranged in a "close cluster" make maximum use of every inch of silver brazing or precious metal strip. This cuts waste, saves you money. Developed originally by Alloys Unlimited for the semiconductor industry, this new technique of "close cluster" stamping makes other methods old fashioned. Start saving. Send us your specifications, then compare our bids with your present costs. No obligation, of course.

Alloys Unlimited, Inc., 21-01 43rd Ave., Long Island City 1, N.Y.



Use postpaid card. Circle No. 275

This is the AIR HOSE THAT STRETCHES AND RECOILS JUST LIKE A TELEPHONE CORD!

nycoil

**MORE CONVENIENT
AND SAFER TO USE
THAN CONVENTIONAL
RUBBER HOSE**

NYCOIL—the original recoiling air hose made of tough, permanently coiled nylon tubing. It offers more resistance to abrasion and corrosive materials and because of its bright, red color and self-storing ability, NYCOIL contributes to higher safety, better production and good housekeeping. Its smooth inside surface permits better air flow. Easily connected to tools and equipment requiring air pressure up to 200 psi.

Pat. Pending

**SEND FOR DESCRIPTIVE
FOLDER AND PRICES**

**NYCOIL COMPANY
Westfield 1, N. J.**

Use postpaid card. Circle No. 276

national Trade Fairs, U. S. Department of Commerce. The present exhibition is part of the series in the U. S. Government-Industry overseas program, now in its seventh year.

HEADS ILLINOIS TOOL'S OVERSEAS BUSINESS

Wesley R. Johnson, vice president, international division, Illinois Tool Works, Inc., has returned to the company's executive office in Chicago, from where he will conduct the company's foreign activities. For the past six years, Johnson was based in Slough, Bucks, England, where he directed the affairs of the company's English subsidiary. He also supervised the activities of other subsidiaries, affiliates and licensees throughout the British Isle and on the continent.



PRODUCTION MGR. FOR ALLOYS UNLIMITED

David Baldwin has been named production manager of the Cambridge, Mass., plant of Electronics Glass and Ceramics Corp., a division of Alloys Unlimited, Inc. For the past six years he was employed in a similar capacity by the Sagerstown Components Division of Sagerstown Glass Seals, Inc.

WINDER AIRCRAFT OPENS NEW PLANT

The Winder Aircraft Company has opened its new plant facilities at Dunellon Airbase, Fla.

The plant, upon full completion, will include an industrial complex of twelve manufacturing buildings, six of which are already completed, research laboratories, a static and flight test range and engineering and administrative units.

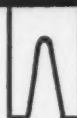
Primary use of the plant will be for the purpose of developing, engineering and manufacturing of new products for the missile-space age.

SHELTON RIVETS

QUALITY • SERVICE • ECONOMY



TUBULAR



SPLIT



**INTERNALLY
THREADED**

**Famous
Since
1836**

Shelton has effectively demonstrated its techniques and practical solutions to creative problems in rivets of all types. A sense of personal responsibility and quality control is the prime asset of this company. It is our desire to serve, secure and retain customers, whether they use 25,000 or 25,000,000 rivets, through an attitude of helpful service. We will consider it a privilege to be invited to discuss your needs.

THE SHELTON TUBULAR RIVET CO., Shelton, Conn.

Use postpaid card. Circle No. 277

Assembly & Fastener Engineering

PROMOTIONS AT GARRETT COMPANY

Francis J. Borowsky has been elected president of the George K. Garrett Co., Inc., Philadelphia. He was formerly executive vice president. J. Donald Clark, former general manager, has been named vice president and secretary. Mrs. Katherine A. Garrett was re-elected treasurer of the company.

HELI-COIL NAMES SALES PROMOTION MGR.



A. J. Favara, formerly advertising manager of Allmetal Screw Products Co., Inc. has joined Heli-Coil Corp. as assistant sales promotion manager.

In his new position, he will have responsibilities for coordinating trade show activities, technical publicity, sales bulletins and brochures, and will direct the activities of the company's Tech-mobile.

His responsibilities will extend to the company's Phelps Manufacturing Division, as well as Grip Nut Co., a subsidiary.

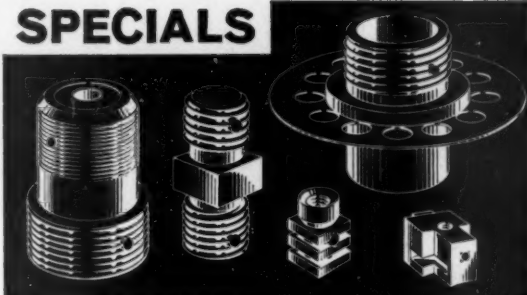
FAUVER CO. CHICAGO REP. FOR HYDRO-LINE

Hydro-Line Manufacturing Co., Rockford, Illinois, has expanded the territory of the J. N. Fauver Co., Inc., to include the Chicago area. Fauver announced the appointment of Frederick R. Hodgkinson as its district sales manager in Chicago.

He will co-ordinate engineering assistance, sales, and service for Chicago users of Hydro-Line hydraulic and pneumatic cylinders, boosters, limit-switch actuators, and related components.

Hodgkinson formerly was associated with Dole Valve Company, and was sales manager for the Controls Division of Scovill Manufacturing Co.

SPECIALS



OR STANDARDS



NYLOK makes any threaded joint reliably self-locking.

Any shape, any size, any material, male or female... if it's a threaded joint, it can be made to:

LOCK... against conditions of vibration and shock

SEAL... against fluid leakage along the threads

ADJUST... prevailing torque keeps it exactly where you wrench it... without being seated

How? Through the application of the patented principle of Nylok fasteners which makes it possible to achieve the torque *you* desire... together with the ability of Nylok engineers to adapt this principle to solve any problem of loosening in a threaded joint.

Your product... and your reputation... suffer with every loosened fastener. The best and most economical insurance against malfunction caused by fastener loosening is a Nylok engineered fastener. Billions of them are now in service in thousands of applications ranging from eye-glass temple screws to missile nose cones. MIL-F-18240A (ASG) states that Nylok fasteners are "intended for use in place of lock-wired bolts and screws".

If it has threads... Nylok will turn any "loosener" into a reliable fastener. Nylok invites your toughest problems. We will pelletize your parts or furnish you with complete special or standard parts to meet your requirements. Send us your problems or call in your Nylok representative and give him the details.

SEND FOR SAMPLES: Describe your application and our fastener specialists will analyze your problem and recommend a solution and they'll send you samples of Nylok fasteners. Write to Dept. N1-212.

FREE DESIGN DATA:

Circle the indicated number on the Reader Service Card, and we'll send you a copy of our 24-page catalog, giving complete, basic product and application data.



THE NYLOK CORPORATION

611 Industrial Avenue, Paramus, N. J.

8048 Central Park Ave., Skokie, Illinois

Nylok Western: 16222 Maple Ave., Gardena, Calif.

Use postpaid card. Circle No. 273

Bridgeport

GENUINE

CUSHION GRIP

SCREWDRIVERS

50% GREATER TURNING POWER

- Super Comfortable
- Non-slip Grip
- Unbreakable Handle
- Fully Guaranteed

Resilient Nitrile Rubber CUSHION GRIP lets you turn screws tighter with less work — reduces fatigue — increases productivity

Blisterproof — oil & water resistant Nitrile Rubber Grip permanently locked into tough amber handle.

New! Patented* INTERLOCK Handle. Cannot slip, slide, twist or come off.

Bolstered Blade winged shank for maximum strength

Tested and acclaimed by electricians, automotive & industrial mechanics under actual working conditions

Blade of high grade chrome plated hardened alloy tool steel

Precision cross-ground point

Available from Jobbers or write to manufacturer

19 sizes and styles. Regular points and Super Hard Phillips. \$1.00 to \$2.80 list. *Pat. No. 2871899

THE BRIDGEPORT HARDWARE MFG. CORP.
BRIDGEPORT, CONNECTICUT
Subsidiary of PURQUIATOR PRODUCTS, INC.

Use postpaid card. Circle No. 273

CONTENTS in this issue

Don't overlook these articles

FEATURES

- 30—An Automotive Look at Adhesive Bonding**
First of two articles on present and future adhesive applications.
- 34—Yankee Ingenuity vs. Imports**
How one company beats overseas producers cost- and quality-wise.
- 36—Expansion-Fitting Bearing Raceways**
Chilling technique simplifies task for machine tool manufacturer.
- 37—Assembly Control Via Data Processing**
Second of two articles on Hughes' scheduling and control system.
- 41—Aerospace Work Sparks Fastener Changes**
Illustrating the trend to stronger but lighter threaded fasteners.
- 45—In-Plant Wire Drawing Ups Pin Quality**
Roller chain firm draws own wire as extra quality control measure.

IDEAS AND REPORTS

- 15—Study the Effects of Vacuum on Metals**
Research into effect of space travel on fasteners, bearings, and seals.
- 16—Tandem Press Speeds Engine Assembly**
Dual-machine inserts bushings and presses plugs in water jacket holes.
- 22—Universal Nut Channel Cuts Cabinet Cost**
Eliminates tapping of sheet metal for mounting electronic panels.
- 20—Stainless Gaskets for Automotive Use**
Manifold and head gaskets designed to last the lifetime of an engine.
- 26—Portable Swaging Machine for Repair Work**
Permits repair of aircraft cables without specialized training.
- 28—High Reliability for Glass Sealed Parts**
Develop seal a thousand times thinner than window glass.



ELIMINATE BUGABOOS OF CORROSION AND MAGNETISM WITH KNU-VISE STAINLESS STEEL CLAMPS



All shown 1/4 actual size

Knu-Vise stainless steel toggle clamps eliminate frustrating magnetic attraction and corrosion while spot welding, or while working near acids.

The complete stainless steel line contains 18 clamps with either horizontal, vertical, or T-style handles. There are types for side mounting and pull clamps as well. Write today for complete information. A standard or a special Knu-Vise clamp will probably be the answer to your application.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS LAPEER MANUFACTURING CO.
3070 DAVISON ROAD
LAPEER, MICHIGAN
WESTERN DIV.: PECK and LEWIS CORPORATION
4430 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7146
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1151 Pettit Road, Burlington, Ontario

Use postpaid card. Circle No. 220

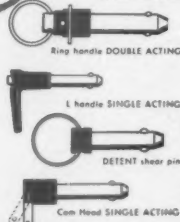
to SECURE IT... to RELEASE IT

Instantly!

AVDEL

POSITIVE LOCKING
QUICK RELEASE

BALL-LOK PINS



Avdel positive locking, quick release pins are the most economical, dependable fasteners for quick assembly and disassembly for joining parts—with positive locking safety.

Avdel Ball-Lok pins are manufactured in several head types. Diameters are available from 3/16" to 3", grip lengths 1" to 6 ft. in various materials and finishes. All Avdel pins are manufactured to NAS standards.

Special pins can be engineered for unusual applications.

Write for application literature

AVDEL INC. 210 SO. VICTORY BLVD., BURBANK, CALIF.
TORONTO, CANADA • HERTS, ENGLAND • GENEVA, SWITZERLAND

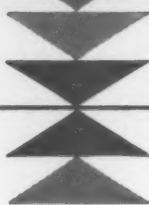
Use postpaid card. Circle No. 281

Assembly & Fastener Engineering



ALLEN MFG. COMPANY	27, Fourth Cover	LABELLE INDUSTRIES, INC.	72
ALLMETAL SCREW PRODUCTS COMPANY, INC.	52	LAPEER MFG. COMPANY	84
ALLOYS UNLIMITED, INC.	82	LEWIS COMPANY, G. B.	58
AMERICAN SEALANTS COMPANY	68	LUCAS-MILHAUPT ENGINEERING COMPANY	61
AMERICAN STEEL & WIRE COMPANY (Division of United States Steel Company)	56, 57	MACCO PRODUCTS COMPANY	47
APCO MOSSBERG COMPANY	53	MAGNETIC PRODUCTS DIVISION (Jess Corporation)	80
APM HEXSEAL CORPORATION	48	MCLAUGHLIN COMPANY, THE	74
ARMSTRONG BROTHERS TOOL COMPANY	78	MERCURY AIR PARTS COMPANY, INC.	69
AVDEL, INC.	84	MINNESOTA MINING & MFG. COMPANY	21
BASSICK COMPANY, THE (Division of Stewart-Warner Corporation)	79	MOLLY CORPORATION	66
BEHR MACHINERY & EQUIPMENT CORPORATION	2	MOORE, INC., GEORGE W.	72
BOWMAN PRODUCTS COMPANY, THE	65	NATIONAL RIVET & MFG. COMPANY	66
BRIDGEPORT HARDWARE MFG. CORPORATION, THE	83	NEWTON INSERT COMPANY	53
BRISTOL COMPANY, THE (Socket Screw Division)	55	NYCOIL COMPANY	82
CAMLOC FASTENER CORPORATION	8	NYLOCK CORPORATION, THE	83
CHANDLER PRODUCTS CORPORATION	26	NYLOGRIP PRODUCTS	79
CHICAGO PNEUMATIC TOOL COMPANY	24, 25		
CHICAGO RIVET & MACHINE COMPANY	54		
CLARK BROTHERS BOLT COMPANY	69		
COOK & CHICK COMPANY	81		
CRAMER DIVISION (Giannini Controls Corporation)	1		
DETROIT POWER SCREWDRIVER COMPANY (Subsidiary of Link-Belt Company)	18		
DIMCO-GRAY COMPANY	53		
DIXON AUTOMATIC TOOL, INC.	13		
DRIV-LOK SALES CORPORATION	78		
DZUS FASTENER COMPANY, INC.	49		
EASTMAN CHEMICAL PRODUCTS, INC.	59		
EATON MFG. COMPANY (Reliance Division)	19		
ELASTIC STOP NUT CORPORATION OF AMERICA	23		
ELCO TOOL & SCREW CORPORATION	60, 61		
FASTEX DIVISION (Illinois Tool Works)	7		
FEEDMATIC-DETROIT, INC.	64		
GARDNER-DENVER COMPANY	4		
GILLEN COMPANY, JOHN (Subsidiary of Stanray Corporation)	69		
GOODRICH AEROSPACE & DEFENSE PRODUCTS, B. F. (Division of B. F. Goodrich Company)	22		
GRIP NUT COMPANY (Subsidiary of Heli-Coil Corporation)	20		
HARTWELL CORPORATION, THE	16		
HINDLEY MFG. COMPANY	73		
HUBBELL, INC., HARVEY	65, 67		
JACOBSON NUT MFG. CORPORATION	81		
JESS CORPORATION (Magnetic Products Division)	80		
KEYSTONE STEEL & WIRE COMPANY	17		
		OHIO ROD PRODUCTS COMPANY, INC.	68
		PALNUT COMPANY, THE	46
		PENN ENGINEERING & MFG. CORPORATION	62
		PHEOLL MFG. COMPANY, INC.	Second Cover
		PROGRESSIVE WELDER & MACHINE COMPANY	75
		ROSAN, INC.	3
		RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY	29
		SCREW & BOLT CORPORATION OF AMERICA	50
		SCREW RESEARCH ASSOCIATION	14
		SHELTON TUBULAR RIVET COMPANY, THE	82
		SNAP-ON TOOLS CORPORATION	6
		SOUTHCO DIVISION (South Chester Corporation)	10
		SOUTHERN SCREW COMPANY	76
		STURTEVANT COMPANY, P. A.	73
		THOMSON MFG. COMPANY, JUDSON L.	Third Cover
		TINNERMAN PRODUCTS, INC.	70
		TITAN TOOL COMPANY	80
		TOWNSEND MFG. COMPANY, THE H. P.	60
		UNITED SHOE MACHINERY CORPORATION (Powasert Division)	28
		UNITED STATES STEEL COMPANY (American Steel & Wire Company)	56, 57
		XCELITE, INC.	12

INDEX TO ADVERTISERS



ONE LAST WORD

MAKE THE REWARD EQUAL TO THE RISK



This is the Age of Incentives. Even the sweeper is included in the group bonus plan; from the president, through sales manager and salesmen and on to the assembly line workers, incentives wind their rewarding way. There is ample precedent for this on a larger, and more basic national scale. Pioneers hacked and hoed their way to fame and fortune; rails and bridges girded and spanned the nation—a symbol of effort and reward. For the successful the laurel, for the failure the hemlock.

For almost everybody, that is, except the engineer!

Incentives, bonuses, rewards have passed him by. Here, there is neither fame nor fortune. There is only failure. Where is the engineer who gets a bonus if he saves 100 thousand dollars in production costs? Or reduces the cost of manufacturing by 1, 2 or even 3 per cent? Or introduces devices which slash direct labor cost?

Where lies the reward for the engineer? Where is the pay-off for the successful new concept, the ingenious tooling, the numerical control equipment? When are the midnight oil, the doodling, and the dreams translated into coins of the realm?

Alas, I cannot answer that question! But this is known: If the idea isn't successful, if the clever tooling

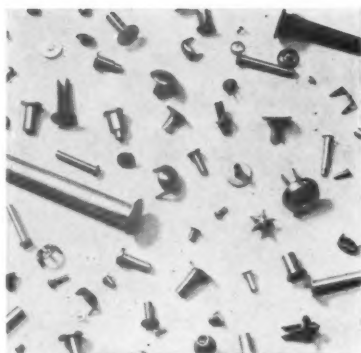
literally crawls with bugs, his name will be stricken from the records, his desk moved into a dark corner and his telephone disconnected. He'll be a non-entity, and people will point the finger of scorn. An engineer can't bury his mistake, can't curse poor economic conditions because the order was lost, and can't blame his subordinates because the new product recently introduced laid an egg the size of a football. No, his mistake adorns him like an albatross.

Thus we have a situation where the engineer is not rewarded for success but flayed for his failure. The result? No large ideas, no mighty ventures, no daring proposals—only mewling, little efforts which are part of his job classification. And this at a time in our nation's economy when every ounce of endeavor and brains and adventuresome spirit is so desperately needed.

Technologically this country has paced the world; production-wise we have shown the way, but the world has caught up. We need to get to work. If you ask what can be done, one answer would be: Free the engineer and the production brains, let them propose and develop and introduce new ideas and concepts, but reward them for their successes. Make the reward equal to the risk.

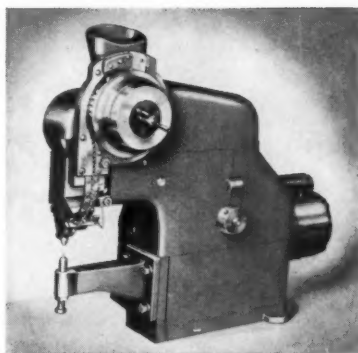
Wm. F. Schleicher

VICE PRESIDENT



OVER 10,000 RIVET SPECIFICATIONS

THOMSON has more than 10,000 different rivet specifications available for immediate manufacture, unsurpassed rivet inventories ready to be shipped from stock, and production capacities of many millions of rivets per day. This is your assurance of obtaining rivets made precisely to your requirements, exactly when you require them. Standard or special, your rivets arrive on time when they come from THOMSON.



OVER 300 RIVETING MACHINE MODELS

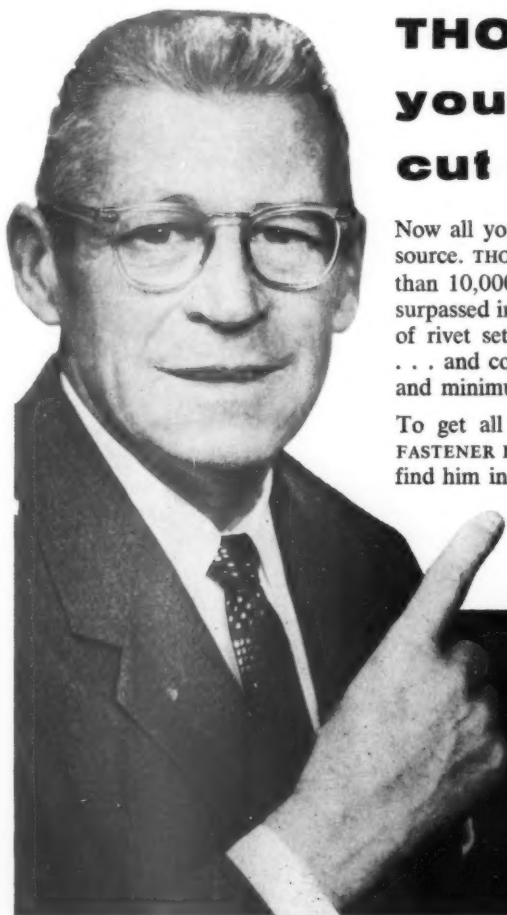
For over 75 years, THOMSON has been designing and building the best in automatic rivet setting equipment. Today, THOMSON offers a complete line . . . more than 300 individual rivet machine styles . . . to handle practically any riveting application more efficiently and more economically. To guarantee constant trouble-free operation in your plant, every machine undergoes extensive factory testing before shipment.



OVER 75 YEARS RIVETING EXPERIENCE

THOMSON has built its business and reputation on its engineering services. Completely equipped and recently expanded to solve all aspects of a riveting problem, THOMSON'S Engineering Department will recommend the specific rivet and rivet setting machine which will give you maximum-speed, minimum-cost fastening. Before finalizing design specifications, it will pay you to check THOMSON for cost-saving, engineering help.

Here's why THOMSON can speed your production . . . cut your assembly costs



Now all your riveting needs are available from one dependable, experienced source. THOMSON offers you a complete fastening package that includes more than 10,000 rivet specifications on hand for immediate manufacture and unsurpassed inventories ready for shipment out of stock . . . more than 300 types of rivet setting machines designed for practically every type of application . . . and complete assembly engineering service to give you maximum-speed and minimum-cost fastening.

To get all the details of this unique package offer, send for THOMSON'S FASTENER FACT FILE. Or better still, call in a THOMSON Fastener Man. You'll find him in the yellow pages.

E101



JUDSON L.

THOMSON

MFG. CO., WALTHAM 54, MASS.

THOMSON (Canada) RIVET CO., LIMITED, Gananoque, Ontario.

ALLEN INTRODUCES

LOKON

NEW general-purpose LOCKNUT holds positively tight even after repeated on-off cycles . . . provides a "commercial" locknut in the "aircraft" quality range . . . offers strength without bulk for heavy-duty applications

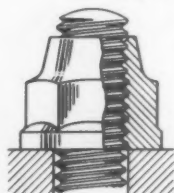
True to its name, the LOKON nut locks on a companion threaded member with a can't-shake-loose grip . . . holds indefinitely against heaviest impact and vibration. Because the basic design allows adequate deformation of the "turret top" without overstressing any portion of the periphery, "LOKONS" are highly resistant to fatigue failure. And, through closely controlled heat treatment, a degree of elasticity is achieved which permits re-use time after time without significant impairment of the locking action.

LOKON locknuts assemble fast and easy . . . start with finger spinning . . . tighten smoothly . . . lock at any point as soon as the threads in the elliptical section are fully engaged, and are readily removed without damage to the nut or mating part.

Investigate LOKON at the first opportunity. Discover the many ways this major development in locknuts can save you time and cut costs. Test samples* and engineering data are yours for the asking. And, for prompt, off-the-shelf delivery, call your nearby Allen Distributor who carries full stocks of LOKON locknuts as well as dependable Allen hex-socket screw products.

*Currently offered in sizes from No. 10 through 1/2", UNC and UNF threads. Other sizes available soon.

HOW LOKON LOCKS . . .



exerted as a result of this diaphragmatic flexing action produce a positive, powerful locking grip.

The threads in the tapered crown of the nut are slightly distorted from the round. When assembled to a companion threaded member, this out-of-round condition causes the nut to resist free entry of the mating part. As the metal flexes in an effort to conform to the circular pattern of the male threads, friction on the flanks of the nut threads is increased. The compressive forces



Only "LOKONS" offer all these extras . . . all without EXTRA COST!

ONE-PIECE, ALL-METAL CONSTRUCTION — The LOKON design requires no segments, inserts or other auxiliary locking devices.

HIGH-GRADE ALLOY STEEL — Heat treated to Rc 26/30. Imparts tensile strength in excess of 250,000 psi and provides lasting spring tension for unlimited re-usability.

CLASS 3B THREADS — Comply fully with specification MIL-S-7742 and H-28 Handbook.

BUILT-IN FLANGE — Large-area bearing surface saves washer cost, speeds assembly, reduces indentation. Face of flange is held square with threads to insure even distribution of stresses throughout the flange and thread area.

DIMENSIONAL ACCURACY — Allen "pressur-forming" processes control grain flow, hold tolerances to consistently close limits, and produce fully-formed hex corners for sure-grip wrenching.

HIGH TEMPERATURE SERVICE — Performance is unaffected at temperatures to 550°F.

MILITARY SPECIFICATIONS — LOKON locknuts fulfill the performance requirements of MIL-N-25027.



ALLEN

THE ALLEN MANUFACTURING COMPANY • HARTFORD 1, CONN., U.S.A.
PLANT AT BLOOMFIELD, CONN. • WAREHOUSES IN CHICAGO, CLEVELAND, LOS ANGELES



FOR OVER 50 YEARS, MAKERS OF FAMOUS ALLEN SOCKET SCREW PRODUCTS

Use postpaid card. Circle No. 203

